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Office of Critical Infrastructure Protection and Emergency Preparedness

Bureau de la protection des infrastructures essentielles et de la protection civile

Airport Closures in Natural and Human-Induced Disasters: Business Vulnerability and Planning

Acknowledgments

This publication has been prepared for:

Office of Critical Infrastructure Protection and Emergency Preparedness

2nd Floor, Jackson Bldg.
122 Bank St.
Ottawa, ON K1A 0W6
Tel: (613) 994-4875
Toll Free: 1-800-830-3118
Fax: (613) 998-9589
Email: communications@ocipep-bpiepc.gc.ca
Internet: www.ocipep-bpiepc.gc.ca

Author:

Stephanie E. Chang, Ph.D.
Diana Ericson, M.A.
Laurie Pearce, Ph.D.

The Disaster Preparedness Resource Centre
University of British Columbia

This material is based upon work supported by the Division of Research and Development (DRD) in the Office of Critical Infrastructure Protection and Emergency Preparedness (OCIPEP), formerly Emergency Preparedness Canada, under Contract Reference No. 2002D009. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Office of Critical Infrastructure Protection and Emergency Preparedness.

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Catalogue No.: PS4-8/2004E-PDF
ISBN: 0-662-37716-8

Executive Summary

Recent events such as the 2001 Nisqually earthquake and the terrorist events of September 11, 2001, have demonstrated the need to take air transportation disruption into greater consideration in emergency preparedness and contingency planning. Closures, if they persist for any length of time, can cause serious economic loss and disrupt important urban services.

This study explores the potential impacts of major airport disruptions. It emphasizes earthquake and terrorism threats. While it focuses on the Vancouver International Airport and related businesses, many of the findings are applicable nationwide. The methodological approach consisted of a literature review, gathering of statistical data, development of two airport disaster scenarios, identification of stakeholder groups, and nearly 40 interviews with selected stakeholder representatives in the Vancouver area and the U.S.

Vancouver International Airport is one of the major generators of employment in British Columbia. In 2000, it accounted for some 26,000 direct jobs, including employment by the air carriers, the airport authority, and businesses and organizations that directly support air transportation (e.g., catering companies and freight forwarders). Its direct contribution to gross regional product has been estimated at $1.7 billion. Some 15.5 million passengers used the airport in 2001. In terms of cargo handling, Vancouver ranks third among Canadian airports on a value basis.

Earthquakes are an important risk in the Vancouver area. Earthquakes have caused airport damage and disruption in the past. In the 1989 Loma Prieta earthquake (M 7.1), the Oakland International Airport lost 3,000 feet of its 10,000-foot main runway. Emergency repairs took place over 30 days, and final repairs required six months. In the 2001 Nisqually earthquake, the control tower of SeaTac International Airport was heavily damaged resulting in airport closure for a period of two hours, during which time a temporary control tower was set up. However, the airport had to operate at reduced capacity for a period of approximately three months, largely due to reduced visibility from the temporary control tower. Boeing Field, the major cargo airport in the region, suffered considerable runway damage. Emergency repairs required about two weeks to complete.

The threat of terrorism was dramatically illustrated in the events of 9/11, which affected all North American airports. Perhaps the most severely impacted was Ronald Reagan Washington National Airport in Washington, D.C., which was closed for 23 days and gradually re-opened over the course of six months. Passenger volumes dropped considerably due to airport restrictions, traveler shifts to other airports and other modes of transport, and general decreases in tourist and business travel. The greatest business impacts were suffered by airlines, tourism, and businesses at the airport itself. Impacts on cargo were limited because Reagan National Airport is not a major cargo centre. Impacts on the regional economy were limited because of the availability of two other major airports nearby.

Vancouver area businesses also suffered losses from 9/11. Airlines and airport terminal businesses were most immediately impacted by airport closure. These impacts continued once flight restrictions were lifted due to a vastly altered air travel environment. Enhanced security

measures and fear of air travel resulted in reduced passenger volumes, and in many cases those that did travel now passed their time in security clearance queues rather than in shops and eating establishments at the airport. Cargo and mail shipments were similarly affected by the introduction of numerous new rules and regulations following 9/11. Some airlines cancelled cargo operations for a period of two weeks, unable to stay abreast of the changing guidelines. Storage problems, diversion of goods to alternative transportation systems and the handling of perishable goods were some of the issues that arose for this sector. The tourism and hospitality sector experienced an increase in short-term business during the crisis due to stranded visitors. However, cancellations and reduced bookings post-9/11 have resulted in a long-term decline in overnight guests in Vancouver with a ripple effect on all related businesses such as restaurants, bars, specialized retail shops, and so on. Convention travellers and cruise ship passenger volumes remain down from pre-9/11 levels.

In this study, businesses were interviewed regarding their experiences of airport-related disruption and the potential impacts of two hypothetical disaster scenarios. For most of the businesses, the 9/11 incident was their primary point of reference. The scenarios, developed for this study, included one of a major earthquake in the Vancouver area and one of a terrorist event (hijacking).

Eight stakeholder groups or economic sectors were found to be especially vulnerable in the event of airport disruption: 1.) air transportation (passenger); 2.) air transportation (cargo); 3.) businesses at the airport; 4.) tourism; 5.) agriculture, fisheries, and aquaculture; 6.) small businesses, 7.) rural B.C. communities; and 8.) health services. A series of major potential impacts is identified for each of these groups or sectors. In addition, more detailed information is also developed. This includes a list of stakeholders specific to Vancouver International Airport and a detailed database of impacts for various groups and sectors.

For example, it was found that in air cargo transportation, because of the time-sensitive nature of many of the goods, even short disruptions in the air transport system can cause major business impacts. Restrictions on nighttime landings could have major repercussions for some cargo transporters, and may cause Vancouver to be dropped from some cargo routes. Air cargo capacity on commercial airlines is vulnerable to flight cancellations and scheduling changes that are made on the basis of passenger considerations. Air cargo can be impacted by restrictions and regulatory policies originating not only with the federal government, but also in the U.S. Smaller, less diversified cargo-related companies would be especially hard hit. The industry's locational concentration around the airport would compound the effects of an earthquake disaster.

In the tourism sector, it was found that disasters that affect Vancouver's reputation as a destination, such as earthquakes, would cause major and sustained losses to tourism. The cruiseship-related industry is especially at risk of losing business to Seattle in a disaster. Small businesses in the tourism sector and those with small margins and cash reserves are especially vulnerable. A disaster in the summer would have especially great impacts on tourism, particularly if it were to occur on a weekend. Lost business in the tourism sector is very difficult to recapture.

Very few of the businesses interviewed had actually planned for airport-related disasters. However, their experiences provided a series of lessons learned and "best practice" knowledge that is also documented in the report. For example, business continuity plans should include key information on several alternative airports. They should include a specified and tested plan for alternative ground transportation. They should address contingencies for handling supply shortages caused by air transport disruptions. They should include provisions for handling perishable goods in a disaster. They should consider how the business could offer alternative products or services to capitalize on new demand in an emergency. Business associations should be prepared to serve lobbying functions or provide a centralized information source in case of disaster.

This report is supplemented by a business planning guide, "Airport Closures: A Guide for Businesses" (Appendix C).

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1.0 Introduction

This project addresses business contingency planning with respect to emergency airport closures in Vancouver, B.C. It focuses on the nature and extent of Vancouver business vulnerability to major disruption of the critical infrastructure sector of air transportation. The emphasis is on earthquake and terrorist event disruptions. The vulnerability of important service institutions, such as healthcare providers, is also considered. Recent events such as the Nisqually earthquake and the terrorist events of September 11th in 2001 have clarified the need to take air transportation disruption into greater consideration in emergency preparedness and contingency planning. Closures, if they persist for any length of time, can cause serious economic loss and disrupt important urban services.

The Vancouver International Airport (YVR) accounts for a substantial amount of employment in the Vancouver region. The total number of jobs in the airport community in 2000 was estimated at over 26,000 (Vancouver International Airport Authority, 2001). In the event of a disaster, economic activity both directly connected to the airport and indirectly dependent upon it would be impacted.

The introductory section of this report summarizes the objectives and methodological approach of this study. It also provides background information on the economic activities and impact of the Vancouver International Airport. Section 2 presents an overview of previous experiences of major airport disruptions due to earthquake and terrorist events; the latter focuses on the 9/11 disaster. For the majority of businesses interviewed in this study, the 9/11 event was the only experience of significant airport disruption that they could draw upon. A summary of their impacts is included. Section 3 presents two specific scenarios of airport disruption in Vancouver that were prepared for this study. These scenarios provided a basis for interviews performed in this study with businesses in Canada and the U.S. (Participants in the study are listed in Appendix A.) Section 4 reports on the findings from these interviews regarding significant potential impacts from airport disruptions. It begins with highlights of key sectors and major potential impacts. (For convenience of reference, these impacts are also listed without annotation in Appendix B.) It then provides a more complete database of major stakeholder groups and potential impacts. Section 5 summarizes some "best practice" recommendations that emerged from the interviews. An accompanying booklet, "Airport Closures: A Guide for Businesses," has been prepared to assist with business continuity planning for airport disruptions (Appendix C).

1.1 Objectives

The objectives of this project are as follows:

1. To summarize what is known about the potential for closure at YVR due to earthquakes and terrorism, and the contingency plans in place.
2. To establish the likely impacts of YVR closure on key businesses and institutions in Vancouver (including emergency response organizations) and to determine the extent to which they have planned for this possibility.
3. To summarize lessons learned from the Nisqually and 9/11 disasters in the U.S. regarding business impacts from airport closures and effective measures for working around this disruption.
4. To produce a planning guide for businesses related to airport disruption that can be incorporated into more comprehensive business continuity plans.

The guide is included in Appendix C.

1.2 Methodology

The methodological approach consisted of a literature review, stakeholder identification, and three distinct series of interviews. The literature review was conducted to document recent North American experiences of airport disruption and closure. Searches were made of numerous academic and professional databases. These include: Academic Search Premier (General), Proquest Digital Dissertations (International dissertation index), Sociological Abstracts (includes social planning and policy development), Canadian Newspaper Sources, COMPENDEX PLUS (Engineering and Technology), Search Hazlit (Natural Hazards Research and Applications Information Center, University of Colorado), Transportation Safety Board of Canada, Air Reports, Quakeline (Multidisciplinary Center for Earthquake Engineering Research), and TRIS Online (U.S. Department of Transportation). The literature review was supplemented by email and telephone contact in some cases.

Prior to conducting the interviews, the major stakeholders associated with Vancouver International Airport were identified. This was done on the basis of the experiences of the investigators and information from interviews conducted as part of this project. A subset of the stakeholders was identified for recruitment for the interviews. In their selection, particular attention was paid to getting representation across key sectors that were anticipated to be particularly vulnerable to airport disruption.

Three series of interviews were conducted. In total, some 35 businesses and agencies in Canada and the U.S. were interviewed or otherwise contributed information to this study (see Appendix A). Vancouver area participants were interviewed in-person, while those located elsewhere were interviewed by telephone. Participants were given the opportunity to comment on a draft version of this report.

The first series of interviews was conducted with the objective of developing credible scenarios of airport disruption for Vancouver International Airport (YVR). To this end, key personnel were interviewed at the airport authority itself, as well as related agencies such as the RCMP and key

air transportation businesses such as Canada Post and individual airlines. Interview questions focused on past experiences of airport disruption, disaster scenarios, and plans for responding to potential future disruptions. Two scenarios of potential disruption at YVR – a major earthquake and a terrorist incident – were developed (see Section 3).

The second series of interviews focused on potential impacts of airport disruption on Vancouver area businesses. Interview questions concerned several issues: background on the business and industry; the dependency of the business on the airport; alternative transportation arrangements in the event of airport closure; business continuity planning and any consideration of airport disruption; the impact of the September 11, 2001 terrorism event; the likely impact of the earthquake and terrorism scenarios; and identification of any other business types or sectors that are highly vulnerable to airport disruption. A preliminary database of key stakeholders and impacts was developed from these interviews.

It had been the original intent to also model the economic impact of the earthquake and terrorism scenarios based on information from the interviews. However, because the interviews turned out to provide much more qualitative insight than numbers that could be input into a model, this element was not conducted. Instead, efforts focused on supplementing the interviews with statistical data to establish the context of the impacts.

The third series of interviews focused on business impacts, lessons learned, and "best practice" recommendations from the 2001 Nisqually earthquake and the 9/11 terrorist event. For the latter, attention focused on businesses at Reagan National Airport, which was closed for the longest period of time. In the course of recruiting participants from the U.S., it was found that there remains considerable secrecy surrounding the effects of terrorism – to an extent not seen in the context of natural disasters – and many businesses were reluctant to participate. Interviews with individual businesses were therefore supplemented with discussions with organizations such as Arlington Economic Development (AED) that also had a view of the larger economic impacts of the disaster. Information from these interviews was added to the impacts database (see Section 4) and a list of "best practice" recommendations (see Section 5).

To maintain confidentiality, the material gathered from the interviews is used here without direct quotation or attribution to source, unless the information is already publicly available.

1.3 Economic Impact of Vancouver International Airport

An overview of the economic impact of Vancouver International Airport (YVR) provides a starting point for considering how a disaster might affect the regional economy. YVR is one of the major generators of employment in British Columbia. In 2000, it accounted for some 26,000 direct jobs, including employment by the air carriers, the airport authority, and businesses and organizations that directly support air transportation (e.g., catering companies and freight forwarders). Cargo alone accounts for some 4,000 direct jobs. If indirect and induced jobs are included, YVR supports 60,000 jobs in the region. The economic impact of YVR in 2000 has been estimated at a direct contribution of $1.7 billion to gross regional product (GRP). Including indirect and induced impacts, this figure increases to $3.0 billion (Vancouver International Airport Authority, 2001). In 2001, 15.5 million passengers passed through the airport, including

both enplanements and deplanements. This represents a 55 percent increase from 1992 (www.yvr.ca/ authority/pax_stats/nov2002_pax.pdf).

In terms of air cargo, $3.9 billion in goods were imported through Vancouver International Airport in 2001, and $1.7 billion exported (Schrier, 2003). Vancouver ranks second among Canadian airports on a tonnage basis and third on a value basis (Mathieson, 1998). In value terms, almost one-third of inbound cargo arrives from California, although much of this originally came from Asia. Among the major commodities arriving at Vancouver are computer equipment, optical fibres and aircraft. Over one-quarter of outbound air cargo is transported to Japan or Hong Kong (Mathieson, 1998). In 1996, some 40 percent in value terms of British Columbia exports by air transportation consisted of electronic goods. Fish products – including geoducks, oysters and salmon – accounted for 10 percent, while agri-foods such as ginseng, mushrooms and fresh berries represented another 5 percent. Precious metals and audio/visual goods were also significant (B.C. Stats, 1998).

Exports to southeast Asia are particularly dependent on air transportation. Around 30 percent of British Columbia exports to Hong Kong and Singapore are transported by air. Less than 10 percent of B.C. exports to Europe are by air (B.C. Stats, 1998).

The effects of the terrorist events of September 11, 2001, are indicative of the potential impacts of natural and human-induced disasters on air transportation. While the state of the economy prior to 9/11 was principally responsible for the decline in travel across Canada over the ensuing 12 months, the terrorism event greatly exacerbated the situation. As of July 2002, Canadian commercial aircraft movements had yet to recover. Transborder (U.S.-Canada) traffic was hit especially hard, dropping by 10 percent or more (Masse, 2002).

At Vancouver International Airport, both passenger and cargo volumes were severely impacted in the short term and in some cases have yet to return to pre-disaster levels. For example, passenger volumes – which had been growing throughout the 1990s – were down by 3.5 percent in 2002. For the month of September 2001, passenger volumes were down by 19 percent, in comparison with the same month in 2000. September 2002 figures were still nine percent lower than in 2000[1]. Not all of this loss is attributable to 9/11, certainly; other factors include economic conditions in Canada, the U.S., and throughout the world. Cargo volumes have regained pre-9/11 levels in terms of tonnage[2]. However, some specific cargo sectors have yet to return to pre-9/11 levels.

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[1] www.yvr.ca/authority/pax_stats/ nov2002_pax.pdf

[2] www.yvr.ca/pdf/authority/cargo_stats/ sept2002_cargo.pdf

2.0 Previous Experiences of Airport Disruptions in Disasters

2.1 Earthquakes

Airports have been vulnerable to damage in previous earthquake disasters. According to Werner (1995), "seismic standards for the nation's air transportation system and its components do not reflect the importance of the system to the economy and to life safety, and lag far behind the current state of planning and engineering knowledge for many other critical facilities of this type." For an overview of engineering performance and mitigation recommendations, see Werner (1993; 1995).

Notable North American examples of airport damage and disruption in earthquakes include the 1964 Great Alaska earthquake (M 8.4) and the 1989 Loma Prieta earthquake (M 7.1) (Werner, 1993; ABAG, 2000; EERI, 1990). In the Alaska event, the control tower at Anchorage airport collapsed, the terminal building suffered major damage, and runways and pipelines were cracked. Broken windows in control towers were also experienced in the 1971 San Fernando (M 6.4) and Whittier (M 5.9) earthquakes.

In the 1989 Loma Prieta earthquake, San Francisco International Airport suffered nonstructural and equipment damage in its control tower and terminal. Airport service was stopped for 13 hours. It is noteworthy, however, that the primary reason for this closure was that air traffic controllers had difficulty getting to work and there were insufficient controllers available to safely operate the control tower (ABAG, 2000). In the same event, the Oakland International Airport lost 3,000 feet of its 10,000-foot main runway due to liquefaction and lateral spreading of the ground. Cracks were as wide as three feet, and sand boils as wide as 40 feet. Emergency repairs of 1,500 of the 3,000 damaged feet took place over 30 days; repairs of the final 1,500 feet were not completed until six months after the earthquake. For some businesses, the impacts were significant; for example, one financial institution continued to charter helicopters as an alternative mode of transport for up to three months after the disaster.

The 2001 Nisqually earthquake that struck the Seattle region significantly restricted air transportation (EERI, 2001). SeaTac International Airport suffered control tower damage that necessitated use of a portable control tower and reduced capacity. Water damage also closed one of the terminals for three days. Boeing Field (King County International Airport), the major cargo airport in the region, suffered major liquefaction damage. Its short runway was closed for two days. The long runway was heavily damaged. Large jets were unable to take off for several days, and it was approximately two weeks before emergency repairs on the long runway were completed (Personal communications, C. Stewart).

Based on experiences in past earthquakes, a review of airport seismic vulnerability in the San Francisco Bay Area identified four main issues (ABAG, 2000):

1. Liquefaction damage to airport runways;
2. Damage to air control and terminal facilities;
3. Power and communications disruptions;
4. Disruptions to the transportation and fuel systems serving the airports.

Similarly, a review of air transportation vulnerability in earthquakes in the Central U.S. indicated six components of airport facilities which are most vulnerable: terminals; runways; power, communication, and radar; and liquid fuel and transport (CUSEC, 2000). It anticipated that in a major earthquake, airports near the epicentre might not be operational for weeks. This has implications for both regular passenger and cargo flows and the transport of emergency relief personnel and supplies.

2.2 9/11 Terrorism Event

This section reviews the impacts of the September 11th terrorist events on air transportation disruptions. It provides an overview of the air traffic disruptions and summarizes impacts on businesses. While there have been other experiences of terrorist threats and acts that affected airports (see, for example, New York Times, 1995), the September 11th disaster is extremely important for this study both because of its unprecedented magnitude and because, for many businesses, this is the only major airport disruption that they have experienced. It therefore represents a critical "datapoint" from which to anticipate how potential airport disruptions might affect businesses.

Several issues with regard to terrorism attacks on airports are illustrated by this event:

1. The need for effective terrorism threat assessment procedures;
2. The handling of immediate flight delays, diversions, cancellations, and passenger and baggage processing;
3. Mitigation of the psychology of fear that results in ongoing loss of the air passengers;
4. The rippling effects on related businesses that serve or depend on the air transportation system.

2.2.1 Air Transportation Disruptions

The 9/11 terrorist attacks had an impact on all North American airports. After the second attack on the World Trade Center, the Federal Aviation Authority (FAA) issued a "ground stop" which prevented all civil flights from taking off and, after the Pentagon was hit, the FAA ordered the grounding of all flights in U.S. airspace. When word came that a fourth plane was bound for the White House, the Metropolitan Washington Airports Authority began to evacuate the Reagan National and Dulles International airports. The closure of air space over North America was an unprecedented event and involved a massive diversion of U.S. bound planes and passengers to Canadian airports and considerable disruption of all air travel over the continent for the next two days and beyond. Following the second attack on the World Trade Center, Transport Canada activated its Situation Centre (SitCen) and prepared to handle planes diverted from U.S. airspace. In the course of the next few hours, Canada received 224 diverted passenger flights carrying more than 33,000 passengers and 10 diverted cargo flights distributed at airports across the country (Transport Canada, 2003). All passengers and cargo had to be unloaded and cleared through customs. Two hundred and seventy trans-Atlantic flights were requested to return to Europe. Departures from Canadian airports were halted until the afternoon of September 12th while new security requirements were drafted. Departure restrictions were lifted in stages beginning with diverted domestic flights. All passenger flights, under stricter security conditions,

had been given clearance by the morning of September 13th when U.S. air space was again open, but restrictions on cargo transportation continued until the evening of September 14th (ibid.)

The Vancouver International Airport received 34 diverted aircraft, carrying more than 8,500 passengers and 24,000 pieces of luggage. Passengers were deplaned and cleared through customs, while luggage was separately unloaded and re-searched. Normal flight scheduling did not resume until September 14th. Priority was given to clearing diverted aircraft and regularly scheduled flights. No new flights were created at that time to accommodate stranded visitors whose flights had been cancelled during the crisis.

One of the Canadian communities that was particularly impacted by the air transportation events of September 11th – and which was well documented – was Whitehorse, Yukon. Two Boeing 747 Korean Airlines flights were diverted to Whitehorse International Airport. One of these, Korean KAL HK 7464 (a 250 passenger 747), was believed to be involved in a hijacking situation. An evacuation of schools and selected buildings (e.g., federal buildings), closure of portions of the Alaska Highway, and the inability of the cellular phone network to handle the increased number of calls, contributed towards major problems for the citizenry and the business community. Nevertheless, once the initial fears were contained, a number of businesses in the service industry (i.e., hotels) experienced a short-term increase in business. For a detailed documentation of the airport and community's response, see Government of Yukon (2001).

The airport most affected by the event was perhaps the Reagan National Airport in Washington, DC. Because of its close proximity to potential terrorist targets in Washington, government officials ordered it shut down right after the attacks without sufficient understanding of the economic consequences of this action. It remained closed for the next 23 days. Thereafter, it was allowed to reopen in four phases over six months. On April 15, 2002, the airport was officially 100 percent opened. However, restrictions remained in effect, banning large airplanes, private aircraft or general aviation, nighttime takeoffs and landings, and certain flight paths. In October 2001, flight activity at Reagan National Airport was 82 percent below levels from the previous October; as of mid-December, flights had only returned to 47 percent due to scheduling problems by the airlines and a shortage of sky marshals (Arlington, Virginia, 2001). Overall, the number of passengers traveling through the airport dropped from 15.9 million in 2000, to 13.3 million in 2001, and even further to 12.9 million in 2002 (Holzheimer, 2003). This was due in part to conditions at the airport, overall trends in North American aviation following 9/11 (related to both the economic downturn and the effects of terrorism on the public's willingness to fly), and some potentially permanent losses in passenger base to competing regional airports.

Other smaller airports in the Washington, DC area continued to feel the effects of airport closure for many months after the terrorist events. Hyde Field airport, a small general civil aviation airport in the Washington area that handled 38,000 flights per year before the terrorist attacks, was closed down after September 11th and didn't re-open until the first week of March 2002. It was then re-closed in May due to failure to adhere to new security rules. Although these problems were quickly addressed, Hyde Field remained closed as of July 2002 (*The Washington Post*, July 25, 2002, p.T03).

2.2.2 Business Impacts in the Washington, DC Area

The lengthy disruptions at Reagan National Airport caused substantial losses to regional businesses. The recovery has been very slow, and general aviation (including corporate aviation) has, as of this writing, yet to recover. It has been estimated that the economic impact of the closure was "$330 million per day to the airport and Northern Virginia businesses and $27 million to state and local tax revenues" (Rubin and Renda-Tanali, 2001: 9; citing *Business Week*, October 22, 2001: 102). Individual businesses at the airport reported as much as a 60 percent loss over the fiscal year due to the closure, the fact that the airport was not operating at capacity when it reopened, and the nationwide reductions in passenger volumes. The economic losses for Hyde airport and surrounding small business owners was estimated to be in the tens of thousands of dollars (*The Washington Post*, July 25, 2002, p.T03).

The prolonged closure at Reagan National Airport, and restrictions associated with its reopening, have had a major impact on certain sectors:

- Airlines
- Businesses at the terminals
- Tourism and hospitality, especially hotels
- Taxicabs
- Fixed-base operators (e.g., charter corporate jets)

The greatest impact of the Reagan National Airport closure was on the airlines, tourism, and businesses at the airport itself. Since 9/11, two airlines of importance to northeast US air travel, United and US Airways, were pushed into Chapter 11 bankruptcy, from which US Airways is now in the process of exiting. However, US Airways, in particular, was dependent on Reagan National Airport and if the airport had not re-opened, the airline would have gone out of business. In the aftermath of September 11th, many people and businesses have reduced travel. On shorter-haul routes, many passengers chose to shift to other modes of transport such as Amtrak (rail). This led to a significant drop in air traffic volume on the shuttle services in the important northeast corridor of the U.S.

Businesses at the airport itself have also been affected by reductions in passenger volumes. It is worth noting in this context that, according to some sources, some of Reagan National Airport's traffic was diverted or captured by competing airports in the region. Some of this lost traffic may never return, as travellers have become accustomed to the alternatives and uncertainties remain about whether Reagan National Airport might again be closed in some future incident. Small, independent businesses at the airport were left particularly vulnerable by the 9/11 disaster. Some went out of business because they could not sustain a month-long closure. National chains also became somewhat reluctant to locate an outlet at the airport because of the possibility of a repeat occurrence of the airport closure.

Tourism, which is defined by the industry to include both business and leisure travel, is a major driver of the DC area economy, and drops in tourist activity is a major factor in the slow recovery for businesses dependent on passenger traffic at Reagan National Airport. Washington is a major destination for school groups and many of these tours have now been stopped. Some of these may simply have been postponed, while others will be permanent losses. The convention

business has not yet fully returned. The drop in tourism has hurt related businesses such as restaurants, car rentals, and so on.

Hotels, particularly those at or near the airport, were also heavily hit. Overall hotel occupancy in October 2001 dropped 16 percent compared to the previous October. An even greater loss, of 25 percent, was suffered in room revenues. Many hotels lowered their room rates in order to generate business and remain in operation (Arlington, 2001). Annual statistics show that hotel occupancies in the region have yet to recover. Average occupancy rate in 2000 was 73.7 percent. In 2001, it was 68.7 percent, and in 2002, it had dropped even further to 67.7 percent (Holzheimer, 2003). Again, this effect was due in part to nationwide economic and air travel conditions, but also in large measure to sustained passenger volume losses at Reagan National Airport and drops in tourism activity in the Washington, DC area.

Brand-name hotels have recovered more strongly than have smaller, independent hotels. This latter group has not had the resources for advertising, marketing, and so on needed to recover quickly.

Another particularly hard-hit group consisted of taxicab drivers. Some 25 percent of local taxi demand is attributable to Reagan National Airport. Cab operators relying on airport traffic reported a 60 percent drop in demand, while those with less airport dependence reported a 15 percent drop. Many of the taxicab drivers are independent contractors who rent cars from taxicab companies. Because of their major loss of income, taxicab companies had to lower the equipment rates they charged to their drivers (Arlington, Virginia, 2001). This group of independent taxi contractors highlights an important problem: independent workers not eligible for unemployment compensation are left without institutional support when injured or without employment after a crisis. Bodies set up to provide compensation, such as the Virginia Employment Commission and the Red Cross, focused on traditional groups and institutions eligible for compensation. They were not interested in adding to their burden by widening the qualifications or assistance provisions. Thus, independent contractors who were most economically injured by the events were those who were least able to afford it (T. Holzheimer, 2003).

While many of these observations represent transferable lessons to places like Vancouver, some differences should be noted. First, the impact on the overall regional economy was mitigated by the availability of two other major airports serving the region, Dulles International and Baltimore-Washington International. In the Vancouver case, the nearest major international airport is Seattle, some three hours' drive away and across the border. Second, unlike Vancouver International Airport, Reagan National Airport is not a major cargo airport for the region. Most of the cargo businesses are located at Dulles.

2.2.3 Business Impacts in Vancouver Area

Disruptions at Vancouver International Airport in the 9/11 incident related mainly to the massive air traffic diversions that took place over North American airspace and the banning of departing flights for two to three days. On September 11, 2001, the airport had to handle as many as 34 diverted airplanes, with over 8,500 diverted passengers and 24,000 pieces of luggage. The stranding of the passengers led to serious issues of crowding and fire code hazards. Customs clearance of the influx of people required flexibility, and exceptions were made to standard protocol to allow passengers to be screened separately from their luggage. Logistical issues arose with regard to protecting all of the aircraft while they were grounded at the airport. Other issues, such as the lack of trained ground personnel for certain types of aircraft (i.e., Boeing 777's) also arose. The main problem for businesses dependent on the airport was the lack of official, central means for communicating information. Communication was often confused and inaccurate.

There was a wide range of business impacts resulting from these events, some of which have been ongoing. The following discussion provides an overview of the types of impacts experienced. Included briefly in this discussion are some effects experienced by the healthcare system and by the City of Richmond, the municipality adjacent to the Vancouver International Airport.

There was an immediate impact on businesses operating out of the airport terminal. Some businesses, including both terminal shops and inflight services, closed immediately due to the confusion of the events and security concerns. Business disruption at the airport continued for up to three days as new safeguards were introduced and flight restrictions were gradually eased. The business disruption during this period resulted in significant layoffs. Post 9/11 travel patterns have continued to have an impact on airport terminal businesses with the reduction in charter holiday travel (with the loss of Canada 3000) and increased security measures leading to fewer travellers with the time to shop and enjoy restaurant meals in the terminal. Businesses servicing planes on the tarmac have similarly been affected by the consolidation of flights, cancellation of some routes, and the move toward "no frills" traveling which has meant less prepared food served on flights.

Business losses among the airlines were significant in this event with some losing more than $1 million per day while grounded. Flight cancellations by frightened travellers continued for three to four months. For some airlines, the cancellation rate was on the order of 30 percent. The response was, as noted above, to consolidate flights and cancel some routes in order to reduce losses. In some cases, it has taken up to a year to get back cancelled flights. Passenger volumes have still not recovered to their pre-9/11 levels.

Restrictions on mail service on passenger flights remained in place for four days. New regulations were introduced requiring a holding period to ensure that no explosive devices were contained in mail being shipped through air service. Further precautions prohibited packages over a certain weight limit on passenger aircraft. Following 9/11, a number of anthrax threats highlighted the vulnerability of the postal service to such terrorist threats. There were 432 reported incidents of potential anthrax cases, resulting in a loss of productivity.

Cargo-related businesses, including air couriers, were significantly impacted by the 9/11 event. Air cargo movement was stopped for four days while enhanced security requirements were put in place. Much confusion existed around the new rules and regulations, many of which were originating with the U.S. government. As a result, finding it difficult to remain abreast of the new rules, some airlines stopped taking cargo for two weeks. Security regulations required the re-certification of sales staff and freight forwarders, as well as a restriction on the transportation of goods to known shippers only. As noted above, holding periods were also implemented. Timing is critical for the cargo/courier sector. Lack of information during the crisis made it difficult to determine which goods to divert to an alternative ground system and when to do this. A lack of warehousing facilities makes it essential to keep goods moving. Delays caused some concerns over storage space. There were losses of perishable goods due to shipment delays. Reduction of passenger flights following 9/11 meant generally less cargo capacity. These business disruptions resulted in layoffs in some cargo-related businesses and some full-time positions have been permanently converted to part-time positions to reduce losses. Some areas of cargo business have still not recovered to their pre-9/11 levels.

Tourism, B.C.'s second largest economic sector, suffered significant and ongoing impacts from the airport closure of 9/11. Immediate response efforts were difficult due to the lack of centralized information coordination. Getting correct information out to the public proved difficult (e.g. hotels were reported to be full when in fact rooms were available). There was little response readiness in the industry to handle the emotional trauma of stranded passengers. Salary and hiring freezes have been implemented in this sector due to the uncertainty in the tourist trade. There has been a significant decline in overnight guests. In comparison with a projection of 8.6 million overnight guests for 2001, actual numbers were only some 8.3 million. Similarly, pre-9/11 projections for 2002 anticipated 8.8 million overnight guests, while the real number was 8.3 million.

Cruiseships account for a large proportion of the tourism trade in Vancouver, with most of the cruise passengers flying in through YVR. During the 9/11 crisis, the ships became hotels for stranded passengers. Passenger numbers have declined since 9/11, but this can be attributed in part to the general economic downturn. A direct result of the crisis was the demise of three small cruise lines, operating close to the margins. However, there was also an upside as some cruise lines repositioned their ships to North America, including Vancouver, due to the uncertainties in trouble spots such as the Middle East and parts of the Mediterranean, thus bringing more potential trade here. Americans make up 80 percent of the cruise trade, so there has been a concerted effort in the business to plan itineraries that are close to home, which fits in with the U.S. "Homeland Policy."

Hotels experienced short-term gains in business during the crisis due to stranded visitors. However, cancellations for previously booked rooms were significant and much of that business was permanently lost. Tour groups did not rebook and some tour operators went out of business. This was in part due to wider economic considerations that were exasperated by 9/11. As noted, the number of overnight guests remains down from pre-9/11 figures. Hotels located at or near the airport were especially hard hit by the decrease in air travellers. They also experienced a new source of competition from downtown hotels that lowered their rates to attract visitors who previously might have avoided the extra costs of being close to city amenities. Nevertheless,

there have also been some gains for airport hotels in overnight business as people now arrive the night before a morning flight to allow time for security clearance.

Financial institutions were somewhat impacted by air transportation disruption in terms of delays in check-clearing and bill payment. Although financial transactions have been steadily moving from paper to electronic transactions since the 1990s, there is still considerable movement of paper from one data centre to another. The major impact of 9/11 was concern over whether or not return time-frames on some items had been respected. Another impact concerns the post-9/11 anthrax scare. The banks experienced a number of biochemical attack threats indicating the vulnerability of this sector to such business disruptions.

Health care institutions have generally worked on the principle of being self-sufficient for 72 hours. While there were some problems getting supplies during the 9/11 event, the main concern during the crisis, for at least one hospital, was to provide support services for their staff and get information out to the public regarding how to explain these events to children.

Blood services depend on air transportation to get fresh blood to processing centres in a timely manner. During the crisis, blood centres in the more remote areas of British Columbia were shut down because blood could not be transported to the processing centre in Vancouver by ground transportation within the eight-hour time-frame for handling fresh, unprocessed blood. No blood was imported during the three-day period of air transportation disruption, but permission was given to charter a plane to fly out blood supplies in advance of the airport re-opening to passenger traffic. A large public response for blood donations presented some challenges with respect to storage. Increased staff was brought on duty to process the blood collected during the crisis and security was heightened at the blood processing centre.

The City of Richmond is the municipality adjacent to the airport and the main municipal partner in the emergency response efforts. While the response was directed by the Vancouver International Airport Authority, the City of Richmond helped with logistics and provided personnel and services to look after the needs of stranded passengers, as well as the responders who were brought in. The City's role consisted of assisting with accommodation arrangements for passengers, providing a reception centre and goods such as food and tents. Some task confusion occurred (e.g., double booking of hotels by municipal staff and airlines) due to lack of communication and an uncertain understanding of protocol. There were also some differences between the municipal and provincial governments regarding their interpretations of which costs would be reimbursed by the Provincial Emergency Plan and which would be considered part of the regular work of the municipal staff.

3.0 Scenarios of Airport Disruption

The following hypothetical disaster scenarios were developed for use in the Vancouver area business interviews, specifically to explore potential impacts of airport disruption on businesses and the regional economy. They were developed on the basis of a number of stakeholder interviews and background reports.

Few published studies of earthquake scenarios are available for the Lower Mainland. Byrne et al. (1987) investigate the seismic risk of liquefaction at Vancouver International Airport. Munich Reinsurance (1995(?)) develops a detailed earthquake scenario that looks broadly at the Greater Vancouver region, not limited to the airport. Our research did not find any published scenarios of terrorism incidents for airports.

3.1 Earthquake Scenario

It is a sunny Saturday in late July at the height of Vancouver's tourist season. At 11:55 a.m., a severe, shallow earthquake strikes with magnitude 7.0 and epicentre 15 km west of Vancouver in the Georgia Strait. Widespread minor damage is experienced throughout the Greater Vancouver region, with concentrations of moderate to major damage occurring in many older neighbourhoods.

At Vancouver International Airport, the 30 seconds of severe shaking cause the sandy soil to liquefy. The ground settles unevenly and large fissures appear. The runways suffer significant damage. The seawall dikes crack but, as the earthquake did not generate a tsunami, flooding is minor. The older, domestic terminal suffers substantial non-structural damage to windows, light fixtures, and ceiling panels. The international terminal and control tower suffer relatively minor damage. Road access to the airport and to the City of Richmond is severely impacted as several key approach points – including the Massey Tunnel and several older, non-retrofitted bridges – are rendered unserviceable.

At this hour, the airport is very crowded and 200–300 people require medical attention, most with minor injuries. Fortunately, there are no fatalities. A few people panic, but most spontaneously evacuate the buildings in an orderly fashion.

The airport is closed immediately for damage inspection. In addition to the damage to runways, terminals, and access roads, utility service to the airport has suffered major disruption. Backup generators are able to provide limited power as repairs are being made. General telecommunications are damaged and overloaded. Damage to regional water transmission pipelines has left the airport without potable water. The jet fuel pipeline and tank farms have been damaged and the fire department immediately acts to contain the threat of conflagration.

With the initial damage and safety assessment, the airport authority decides to close the airport for 12 hours for cleanup and emergency repairs. However, over the next two weeks, significant aftershocks continue to rock the region and the airport is intermittently closed for reassessment. Road access in the Richmond area is considerably disrupted and airport and airline staff have difficulty reaching the airport. By the end of the first week, one runway is operational at two-

thirds of its normal length and airplanes on the ground are allowed to take off. By the end of the second week, some inbound flights are permitted. However, no nighttime landings are permitted due to the damage to runway lights. The airport must operate at severely reduced capacity for two months: with shortened runways, reduced passenger services and concessions, backup water and electric power supplies, and supplemental jet fuel supplies brought in by truck over congested roads.[3]

The airlines suffer major disruption. In the immediate aftermath, inbound flights are mostly diverted to Calgary. Closer airports such as Abbotsford, Victoria, and Seattle have all been impacted by the earthquake. With aircraft grounded at YVR, ripple effects are felt for nearly a month throughout Canadian airspace in the form of delayed and cancelled flights.

Most airlines choose to reduce their Vancouver service for one to three months, citing the airport disruption and a drop in tourist and business travel to Vancouver. Flights to smaller city destinations are given lower priority. Initially, passenger service is further reduced as emergency response supplies and personnel displace passenger space.

Air cargo is similarly affected. Cargo carried on passenger flights is impacted by the reduced service. Goods carried on dedicated cargo planes are affected by the reduced runway length, congestion, and damage to some ground storage facilities. Cargo requiring refrigeration is impacted by the disruption to electric power at the airport. Mail delivery experiences minor delays, with particularly significant impacts to express mail and service to more remote areas in British Columbia.

3.2 Terrorism Scenario

It is a sunny Saturday in late July at the height of Vancouver's tourist season. At 11:55 a.m., the Vancouver International Airport authority is alerted to a hijacking taking place on an inbound international flight carrying 400 passengers and crew. The hijackers demand that the Canadian government denounce United States policies in the Middle East and negotiate the release of prisoners still being held by U.S. authorities as a result of the 9/11 investigations.

The hijacked plane lands at Vancouver International Airport. The control tower attempts to direct it to a remote area for isolation, but the hijackers force the pilots to park the plane on one of the main runways. As negotiations stall, the hijackers announce that they have planted a bomb in the cargo hold and will detonate it if their demands are not met in 72 hours. They provide sufficient information for the airport authority and RCMP to consider this threat to be credible. The following evening, the military succeeds in storming the plane. The hijackers are killed. A bomb is located on board and detonated safely.

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[3] In the 1989 Loma Prieta earthquake (M 7.1), the Oakland International Airport (some 65 km from the epicentre) suffered liquefaction damage that reduced its 10,000 foot runway to a usable length of 7,000 feet. This damage required approximately 30 days for emergency repairs. In the 2001 Nisqually earthquake (M 6.8), liquefaction also caused damage to the long runway at Boeing Field in Seattle. It was several days before large jets on the ground were able to take off, and some two weeks before emergency repairs on the runway were completed.

During the hijacking, government authorities and RCMP decide to close the airport due to the nature of the threat. For two days, inbound flights are re-routed to Victoria, Seattle, or Abbotsford. Outbound flights are cancelled. With aircraft grounded at Vancouver, ripple effects are felt for several days throughout Canadian airspace in the form of delayed and cancelled flights. Mail delivery experiences minor delays, with particularly significant impacts to express mail and service to more remote areas in British Columbia. After the hijacking incident is over, flights resume on a normal schedule. However, tourist travel to Vancouver is impacted for several months.

4.0 Impacts of Airport Disruption

A database of stakeholder impacts from major airport disruption was developed on the basis of the literature review and interviews with U.S. and Canadian businesses and organizations. Section 4.1 identifies key stakeholder groups and their most important impacts, discussing each one in some detail. The emphasis is on potential impacts from disruption at Vancouver International Airport. For convenience of reference, a summary list of major impacts is reproduced without annotation in Appendix B. Section 4.2 provides a more complete listing of specific stakeholders associated with Vancouver International Airport. Section 4.3 provides a more complete database of impacts.

4.1 Key Stakeholders and Major Impacts

4.1.1 Air Transportation (Passenger)

- Air traffic diversions in a disaster may cause difficulties and entail additional costs for airlines in terms of staffing and servicing the flights.

As aircraft are diverted to other regional airports, deplaning and re-catering the flights would entail additional costs. Moving the ground staff to the other airports may be problematic, especially in an earthquake disaster that caused major disruption of local road transportation.

- A disaster may entail significant financial impacts due to passenger cancellations and refunds.

Following 9/11, some airlines saw as much as a 30 percent cancellation rate. Cancellations affected passenger volumes for two to three months after 9/11. To cope, some route services were reduced or cancelled. Insurance costs also rose substantially after 9/11. The airports were closed for two days while no flights were departing, during which time the airlines lost millions of dollars. In general, fear associated with terrorism events could cause passenger volumes to drop on the order of 20 percent, or possibly up to 50 percent if the threat were aimed specifically at Canadians. Regaining passengers after a disaster would entail additional costs in the form of advertising and fare reductions, for example.

- The impact on airlines would be greatest if the disaster occurred in the peak summer season.

In Vancouver, June through September is the peak tourism season (see below). Passenger volumes are also high for two to three weeks around Christmas.

4.1.2 Air Transportation (Cargo)

- Because of the time-sensitive nature of many air-transported goods, even short disruptions in the air transport system can cause major business impacts.

Air cargo consists generally of time-sensitive commodities. The time-sensitivity may be due to perishability, such as in the case of fresh food products. It may be due to urgency, such as for key machine parts needed for repairs, or legal documents. It may also be due to seasonality, such as

for seasonal clothing or Christmas merchandise. One interviewee gave the example of a sawmill on Vancouver Island that would have lost a $30 million contract if a critical machinery part that was being brought in by airplane had been delayed.

- International (overseas) cargo would be especially impacted.

Transborder (Canada-U.S.) cargo can be transported by truck. There are fewer alternatives for overseas cargo. Ocean transport is much slower and may be unacceptable for time-sensitive goods. One alternative may be trucking goods down to Seattle for loading onto airplanes.

- Restrictions on nighttime landings could have major repercussions for some cargo transporters, and may cause Vancouver to be dropped from some cargo routes.

Dedicated freighter planes are typically flying on a schedule that requires nighttime loading. There is often little flexibility in the scheduling of these flights. For example, for air courier companies, all of the cargo system-wide (e.g., nationally) must be brought in to central facilities during a set time window for sorting and loading onto outbound flights. Delays would cause an unacceptable ripple effect throughout the system. Without the ability to do nighttime takeoffs in Vancouver, meeting the time window requirements may not be possible and some air cargo companies may drop Vancouver temporarily from their scheduled routes. This is relatively easy to do because Vancouver is typically an end point on a "spoke" of the company's air transport network. After 9/11, one company dropped Vancouver permanently from its North American air system as a cost-cutting measure, choosing instead to truck goods to Seattle to be transferred into its air network there.

- Air cargo capacity on commercial airlines is vulnerable to flight cancellations and scheduling changes that are made on the basis of passenger considerations.

Air cargo transport by airlines is primarily a by-product of passenger transport. Cargo is moved in the portion of aircraft belly-holds that is not needed for passenger baggage. For Canadian air carriers, approximately 85 percent of cargo is bellyhold cargo on scheduled or charter passenger flights, rather than carried on dedicated cargo flights (Mathieson, 1998). For Air Canada in 2000, cargo revenues accounted for only six percent of total revenues. Airlines may make decisions to reduce passenger service, but these decisions have an impact on cargo handling capacity. For example, in 2000, Air Canada and Canadian Airlines merged their international schedules. This reduced scheduled cargo capacity and caused difficulties for some cargo shippers (Transport Canada, 2000). Following 9/11, cargo was impacted by the cancellation of passenger flights.

- Air cargo can be impacted by restrictions and regulatory policies originating not only with the federal government, but also in the U.S.

After 9/11, aviation authorities in the U.S. imposed additional security requirements, such as mandatory warehouse holding times for air cargo. Authorities in Canada were quick to follow suit. If the Americans were to impose new restrictions such as a ban on cargo carried on passenger flights, this would most likely have quick and severe impacts on the Canadian air cargo industry.

- Transshipment cargo is especially at risk of being diverted away from Vancouver in the event of a local disaster.

Air cargo leaving Vancouver originates not only from the Lower Mainland, but also from Alberta, eastern Canada, and as far south as Oregon state. For example, one major manufacturer fabricates components in Oregon, trucks them up to Vancouver for direct air connection to Asia, assembles the product in Asia, then flies the finished goods back to North America for distribution and sale. If the airport in Vancouver were disrupted, the goods would probably be flown through Seattle or San Francisco. Diversion of cargo from Vancouver would mean reduced business for local companies in the cargo sector, such as warehousers, handlers, customs brokers, freight forwarders, etc.

- Sea-air transport would be highly vulnerable to airport disruptions.

With globalization, there has been a growth in sea-air transportation of freight. For example, fabrics may go by sea from Asia to Vancouver, where they are cleared at the seaport then moved to the airport for flying to Europe. Another example is car engines, which may be manufactured in Japan, shipped to Vancouver by sea, then moved by air to Europe for final assembly. These are a form of transshippment goods. In the event of a disaster at Vancouver airport, this business could be quickly lost to U.S. West Coast port cities such as Los Angeles, San Francisco, Portland, or Seattle. The flexibility of this type of cargo movement was illustrated in the autumn 2002 West Coast port workers' strike in the U.S. Substantial amounts of cargo were diverted to Vancouver. For example, some shipments were flown into Vancouver and trucked into the U.S.

- Smaller, less diversified cargo-related companies would be especially hard hit.

In the air courier sector, the largest companies typically do integrated air-ground business and own a fleet of trucks. Should air transportation suffer a major disruption, they have the option of transferring the cargo to the ground transportation system. Smaller companies that do solely air transportation would have more trouble making this shift. They may face a shortage of contract trucking capacity, if there were a sudden upsurge in demand for trucks after a disaster. If there were a disaster at Vancouver airport, possibly up to 50 percent of the air cargo might be diverted to ground transport as customers decide to avoid the airport altogether. Many large businesses in this sector operate in more than one city, and are therefore locationally diversified; small companies that only do business in Vancouver would be especially hard hit. Many freight forwarders and customs brokers are small, single-office businesses. Airport closure of one to three months may cause some of them to go under.

- The industry's locational concentration around the airport would compound the effects of an earthquake disaster.

An earthquake that caused significant damage at the airport would also inflict damage upon facilities (buildings, utilities, roads) used by many of the businesses in the air cargo industry. The Cargo Village at Vancouver International Airport houses over 150 companies in a cluster of a

dozen buildings[4]. These include air and integrated courier companies, truckers, freight forwarders, customs brokers, warehousing and handling companies, etc. More than half of the customs brokers in the Lower Mainland are located in the Cargo Village.

4.1.3 Businesses at the Airport

- Businesses that serve the airlines and passengers at the airport – particularly small businesses – would be heavily impacted by airport disruption.

9/11 had a major impact on many of these businesses. For example, caterers preparing in-flight foods laid off as much as half their workforce. This was because with passenger volumes down after 9/11, airlines tried to cut costs by reducing in-flight service. Customer volumes for businesses at the airport have largely followed trends in passenger volumes (see above); more than a year after 9/11, they have yet to fully recover.

- Reductions in business at the airport would have significant ripple effects on the Greater Vancouver regional economy.

Businesses serving the airlines and passengers make millions of dollars of local purchases annually. For example, the fresh foods served onboard aircraft that leave from Vancouver are all purchased through local distributors.

4.1.4 Tourism

- Disasters that affect Vancouver's reputation as a destination, such as earthquakes, would cause major and sustained losses to tourism.

An earthquake would be seen by tourists as specific to Vancouver. In the aftermath of a major earthquake, tourism might be struggling for two years or more. Networks of tour operators and travel agents around the world are important for bringing in tourists; a disruption such as an earthquake could cause these vital contacts to switch to competing destinations. Some terrorism events, such as a hijacking, may have less impact if seen as not aimed at Vancouver, but potentially happening in any other city. Terrorism events that were ongoing or directed at Canadians would cause great losses.

- Tourism is highly sensitive to terrorism events.

The 9/11 disaster caused significant losses in the tourism sector. In September 2001, hotel room revenues dropped 16 percent in the Lower Mainland (B.C. Stats, 2002a). Tourism Vancouver estimates that from September through December 2001, there were 282,000 fewer overnight visitors and $120 million in lost visitor spending due to the 9/11 attacks. The impacts continued through 2002, with $87 million in lost visitor spending from January through May, as compared to "without-9/11" forecasts. Visitor volumes were about six percent lower in 2002 overall (Prefontaine, 2002). Tourism may recover by 2004. The events of 9/11 exacerbated factors such as world economic conditions.

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[4] www.yvr.ca/pdf/business

- The cruiseship-related industry is especially at risk of losing business to Seattle in a disaster.

Competition with Seattle, which has recently built a cruise terminal and is currently expanding it, is already a significant concern for the Vancouver-based cruise industry. A major earthquake striking Vancouver could push cruiselines to reposition their ships out of Seatle. About 80 percent of cruise passengers fly in through Vancouver International Airport. Each cruiseship sailing from Vancouver generates about $1.5 million in regional spending in B.C. and Alberta; in 2002 overall, this amounted to over $500 million. This spending includes food, fuel, hotel, local transportation, and on-shore spending by cruise passengers (North West Cruiseship Association, 2002).

- Small businesses in the tourism sector and those with small margins and cash reserves are especially vulnerable in a disaster.

After 9/11, a number of such businesses in the tourism sector went out of business (Prefontaine, 2002). For example, a number of tour operators that catered to Korean and Japanese tourists – a sector that was already in difficulties due to economic conditions in Asia – were pushed into bankruptcy following 9/11. Similar observations were made in the Washington, DC area after 9/11. The travel industry had been undergoing restructuring prior to 9/11, and the terrorist event caused many travel agents to go out of business.

- A disaster in the summer would have especially great impacts on tourism, particularly if it were to occur on a weekend.

In Vancouver, the main months of the tourism business are May through October. June through September are the peak months. Skiing helps sustain tourism over the winter, along with conventions, but the Alaska cruise market from the U.S. is the major tourist market. A disaster occurring in July, for example, could affect the remainder of the summer tourism season. Most of the cruise passengers arrive and depart on weekends.

- Some businesses may experience short-term gains from the disaster, but this would be more than offset by longer-term losses.

Following a disaster, as in 9/11, there may a short-term surge in demand for accommodations, particularly in the vicinity of the airport. This short-term gain would last only until travellers were able to leave town. The entire hotel industry lost money after 9/11.

- Lost business in the tourism sector is very difficult to recapture.

In tourism, once business is lost, it is generally lost permanently. In 9/11, for example, tour bookings were cancelled rather than rebooked for a later time. Hotel reservations and restaurant patronages are generally cancelled rather than postponed.

4.1.5 Agriculture, Fisheries, and Aquaculture

- Exporters of high-end fisheries products to Asia would be especially hard hit.

Air transportation is important for the export of high-end fisheries products, many of which are shipped fresh or alive. Fisheries products account for about 10 percent of British Columbia exports by air. B.C. exported some $54 million or 1.9 million kg of geoduck clams by air in 2001, most going to Hong Kong and other parts of China (B.C. Stats, 2002b). Other exports include mollusks, oysters, and crabs. Many freight forwarders and businesses related to exports of perishable food products are located near the airport in Richmond. In the disruptions of 9/11, one exporter of fresh seafood lost millions of dollars in product that had to be thrown out due to spoilage.

- Exporters of cherries (in season) and other fresh produce may be very hard hit.

Cherries are a major export cargo in mid-summer. Virtually all of the export revenues for the entire year are earned in this season. Any major disruption during this season would be a disaster for the industry. Many of the exporters are located in Washington state, as well as the Okanagan. Local producers would be hurt most, because it would be expensive and time-consuming for them to establish alternative transportation linkages through other cities such as Seattle or Spokane.

4.1.6 Small Businesses

- Small businesses are especially vulnerable to airport disruptions.

Small businesses are especially vulnerable in disasters, and this observation applies to the case of airport disruptions as well. For example, in the aftermath of 9/11, larger businesses at the affected airports had more resources and flexibility than smaller ones. One airport restaurant that was part of a chain was able to reallocate both staff and perishable food items to its unaffected establishments in town. Larger businesses have more resources to weather prolonged drops in air travel activity, to plan for emergencies, and to invest in post-disaster advertising to regain customers. Large businesses that rely on air cargo transportation may have priority arrangements with couriers or the ability to quickly secure alternative transport arrangements. For example, one large financial institution was able to set up its own ground transportation system in the immediate aftermath of 9/11. In the cargo sector, electronic customs clearance would be more flexible in a disaster than paper filings, and most of the businesses that have yet to move to electronic filings are small businesses.

4.1.7 Rural British Columbia Communities

- Remote communities outside of the Lower Mainland are especially vulnerable to air transportation cutbacks in the event of a disaster in Vancouver.

Many of these communities depend heavily on air transportation for mail (e.g., government pension checks) and general cargo, such as foods and medicines. Even for communities where trucking is an option, the time delay could be significant. For example, it takes one day to get goods to Whitehorse from Vancouver by air, but four days by truck. Vancouver is a hub for most

of the air cargo transportation into and out of British Columbia. This includes both cargo carried on commercial airlines and on dedicated freighter planes. In a disaster, cost and logistical considerations could drive airlines to curtail service, in which case lower priority would be given to some domestic routes, particularly those serving rural communities in B.C.

4.1.8 Health

- The health care sector relies on air transportation for movement of some extremely time-sensitive items such as blood and organs for transplants.

Time-sensitive medical items that are often brought in by air include medical equipment, live organs, specimens, some pharmaceuticals, blood, and so on. Disruption in air transportation would mean delayed patient service and backup in the system. For operations in Vancouver, some 60 percent of transplant organs come through the airport from other parts of British Columbia and Canada. The transport window is only four to six hours for heart and lung organs, so that even organs that arrive from Seattle are transported to Vancouver by air. The time frame varies for other organs: pancreases have a time-frame of six to eight hours while livers and kidneys have a time-frame of approximately 12 hours. In addition to transporting the organs, it may also be necessary to fly the patient in from another part of the province. Abbottsford would be used as a backup airport, but road conditions would need to be suitable. Bellingham in Washington State is another, though less preferable, possibility, as crossings borders with organs presents major difficulties. If the airport were to suffer major disruption, people needing organ transplants could potentially die if organs, supplies, and equipment were not available in time.

- The health care sector in British Columbia relies on air transportation for obtaining many medical supplies.

All hospitals and major health care facilities in Vancouver rely upon air transportation for a significant portion of their medical supplies. One hospital reported that 25 percent of its supplies are transported through Vancouver International Airport. For some types of supplies, the entire inventory is obtained from distributors and manufacturers in Ontario and Quebec. Because the hospitals have very limited storage space on site, they operate on a "just-in-time" basis and rely heavily on frequent air deliveries. Even in non-disaster situations, due to back orders, regular deliveries are often made on a "rush" basis. One major delivery is hemodialysis solution. It is received three times a week and needs to be continually available. Other examples of supplies that are delivered by air include intravenous tubing and solution, prostheses, and pacemakers. Many types of medical equipment are also delivered by air. There are no real alternatives to the airport. While helicopters (which are routinely used for trauma patients) and small planes could still be available if Vancouver International Airport were disrupted, these would not provide a real alternative for the large volume supplies that are needed on a weekly basis. The viability of other airports such as Abbotsford or Victoria would depend not only on whether they survived the disaster, but also on the condition of surface transportation routes.

4.2 Stakeholders at Vancouver International Airport

Many stakeholder groups, including some which were not discussed in the highlights in the previous section, would be impacted in the event of major airport disruption in a disaster. Table 1 lists the major groups for Vancouver International Airport according to four categories: those located at the airport itself, agencies of the federal government, businesses, and other.

Table 1 Major Stakeholder Groups at Vancouver International Airport

Airport	Federal Government	Businesses	Other
Airlines (Passenger) • Air Canada • Alaska Airlines • American Airlines • British Airways • Cathay Pacific • China Airlines • Japan Airlines • Korean Airlines • KLM • Lufthansa • Quantas Airway • United Airlines • WestJet	Agriculture Canada	**Banks** • Bank of Commerce • Bank of Montreal • National Bank • Scotiabank • Toronto Dominion	B.C. Ambulance
Airport Authority • Airport Emergency Planner	Canada Customs and Revenue Agency	**Car Rentals near the Airport** • Discount Car & Truck • Enterprise Rent-a-Car • Dollar Rent-a-Car	Canadian Blood Services
Airport Hotel: • Fairmont Hotel	Canada Post	**Customs Brokers** • A&A Contract Custom Brokers • BGL Brokerage Ltd. • Cole International Inc. • Emery Customs Brokerage • Pacific Customs Brokers Ltd. • Russell A. Farrow Ltd. (Farrow Group) • Summit Customs Brokers • Worldwide Custom Brokers Ltd.	**Consulates** • British Consulate • Japanese Consulate • U.S. Consulate

Airport	Federal Government	Businesses	Other
Airport Staff • mechanics • baggage handlers	CSIS	**Freight Forwarders** • Adanac International Forwarders Ltd. • Braycon International Inc. • Danzas AEI Intercontinental • Golden Jet Freight Forwarders Inc. • Kintetsu World Express (Canada) • Nippon Express Canada Ltd. • Secure Freight Systems Inc. • Wilson Logistic Canada Inc.	**Cruiseship Lines/Associations** • Holland America Line • Princess Cruises & Tours • Northwest Cruiseship Association
Airport Terminal Businesses • Cara Corporation • HMS Host • LSG Sky Service • CLS Catering Service • Dixie Foods • Independents	Department of National Defence	**General Sales Agents** • Air Cargo Trader B.V. (Canada) Inc. • Cargo Sales Resource (Canada) Inc. • ELS Marketing Inc. • Network Cargo	Elected Officials and Mayors of Richmond and Vancouver
Buses serving Airport • Airporter Bus Lines • Perimeter Whistler Express • Pacific Coach Lines (Vancouver Island) • QuickShuttle (Washington State)	Health Canada	**Integrators & Couriers** • BAX Global • DHL International Express Ltd. • Emery Worldwide • Federal Express Canada Ltd. • Mayne Logistics Loomis • Purolator Courier Ltd. • United Parcel Service	Emergency Social Services (Richmond)

Airport	Federal Government	Businesses	Other
Car Rentals operating from Airport • Budget Rent-a-Car • Avis Rent-a-Car • Alamo Rent-a-Car • National Car Rental • Hertz Canada • Thrifty Car Rental	Immigration	**Hotels serving Airport:** • Comfort Inn Airport • Days Inn Vancouver Airport • Delta Vancouver Airport Hotel • Executive Airport Plaza • Hampton Inn Vancouver Airport • Hilton Vancouver Airport • Holiday Inn Vancouver Airport • Ramada Inn Hotel • Vancouver Airport Marriott	**Media:** • The Province • The Vancouver Sun • TV stations (CBC/CKNW) • Richmond News
Related Organizations • Airline Pilots Association • Flight Attendants Association	NAV Canada	**Trucking Companies and Couriers** • AEL Airport Express Ltd. • Aeroground, Inc. • Bankers Dispatch Co. Ltd. – BDC Courier • PDS Pacific Delivery Services Ltd. • Scott Freight Services Ltd. • VTL Express (Vimac Transport Ltd.) • YVR Transport Ltd.	Ministry of Human Resources (ESS)
Fuel Providers • Globe Ground • Hudson General Tank Farm • Shell Oil Tank Farm • Transmountain	RCMP Airport Detachment	**Warehousing and Handling** • Aeroground, Inc. • Air Cargo Handling Service • Airco Transportation Services ltd. • Cargo Service Centre Handling Inc. • IAT Management Group	Provincial Emergency Program

Airport	Federal Government	Businesses	Other
Parking/Parkades at Airport • Gateway Valet & Concierge	Transport Canada		Richmond Emergency Planner
Security • Securiguard • Aeroguard			Richmond Fire Dept.
Taxis /Limousines serving Airport: • Delta Sunshine Taxi • Limojet Gold Express • Richmond Cabs • Vancouver Taxi • Yellow Cabs			RCMP – Richmond Detachment
U.S. Government Agencies • U.S. Customs & Immigration • U.S. Dept. of Justice			Tourism Vancouver
South Terminal businesses (general aviation) • Canadian Western Airline • Hawkair • Helijet • Harbour Air Ltd. • KD Air Corp. • Mountain Aviation • North Vancouver Air • Pacific Coastal Airlines • Seair Seaplanes • Tofino Air			Translink Vancouver Coastal Health Authority Vancouver Port Authority

4.3 Detailed Database of Business Impacts

In addition to the major impacts described in Section 4.1, Table 2 provides a more detailed database of business impacts that could result from airport disruption in disasters. These impacts were identified on the basis of the interviews conducted. The list is not intended to be comprehensive and complete, and could be augmented through further research.

Table 2 Database of Business Impacts

Stakeholder Group	Potential Impact
1. Airlines (Passenger)	▪ Air traffic diversions in a disaster may cause difficulties and entail additional costs for airlines in terms of staffing and servicing the flights; ▪ Crews of cancelled scheduled flights during a disaster would still need to be paid; ▪ A disaster may entail significant financial impacts due to passenger cancellations and refunds; ▪ While passengers are normally responsible for their own accommodation due to flight delays and cancellations, in an earthquake situation, there would be shared costs to which the airport/airlines would contribute; ▪ The impacts on airlines would be greatest if the disaster occurred in the peak summer season; ▪ If the disaster created fear in the flying public there would be consolidation of flights with some flights being lost; ▪ Reduced runway service would cause extra fuel costs for airlines as there would be long holding times for flight instructions. Cancellations would result; ▪ There would be layoffs if flights were significantly affected over the long-run; ▪ In the case of a terrorist event, there would be a rise in security costs; ▪ Short-haul flights would be most impacted if security costs rise as people would consider driving options rather than flying; ▪ Air disruption due to terrorism can cause difficulty and entail additional costs due to liability issues around security provision; ▪ Insurance costs may rise dramatically after a disaster.
2. Airline Support Services ▪ Baggage handlers ▪ Cargo handlers on tarmac ▪ Fuel Suppliers ▪ Inflight catering & cleaning ▪ Mechanics	▪ Flight cancellations would result in less work for this sector and potential layoffs if disruption continued for a significant period; ▪ The restructuring of some airlines after 9/11 resulted in a reduced level of food service, which had an impact on catering services.
3. Airport Terminal Businesses	▪ Businesses that serve the airlines and passengers at the airport – particularly small businesses – would be heavily impacted by airport disruption. ▪ Reductions in business at the airport would have significant ripple effects on the Greater Vancouver regional economy.

Stakeholder Group	Potential Impact
4. Canada Post	▪ In a disaster, remote areas would be most impacted by loss of mail delivery by air transportation. Some are not accessible by road and float planes have weight limitations; ▪ Terrorist events would result in mail delays while security holding measures were placed on movement of goods; ▪ Mail service is particularly vulnerable to biochemical terrorism attacks and scares causing delays.
5. Cargo Businesses ▪ Brokers ▪ Cargo Handlers ▪ Freight Forwarders ▪ Warehousing	▪ Because of the time-sensitive nature of many air-transported goods, even short disruptions in the air transport system can cause major business impacts. (Fish/flowers/cherries/critical machine parts, medical equipment, or supplies); ▪ International (overseas) cargo would be especially impacted; ▪ Restrictions on nighttime landings could have major repercussions for some cargo transporters, and may cause Vancouver to be dropped from some cargo routes; ▪ Air cargo capacity on commercial airlines is vulnerable to flight cancellations and scheduling changes that are made on the basis of passenger considerations; ▪ Air cargo can be impacted by restrictions and regulatory policies originating not only with the federal government, but also in the U.S.; ▪ Transshipment cargo is especially at risk of being diverted away from Vancouver in the event of a local disaster; ▪ Sea-air transport would be highly vulnerable to airport disruptions; ▪ Smaller, less diversified cargo-related companies would be especially hard hit (job losses); ▪ The industry's locational concentration around the airport would compound the effects of an earthquake disaster; ▪ Tax revenue: $40,000/day are collected in tax revenue from YVR cargo. This would be delayed and possibly lost in part; ▪ Restrictions would be placed on using new shippers in the event of terrorism thus restricting business; ▪ There would be significant costs to having planes sit idle on the tarmac.
6. Couriers	▪ Small courier companies without a backup trucking system would suffer in a disaster causing air transportation disruption; ▪ A decline in tourist business would have an impact on courier service as tickets are generally sent through couriers.
7. Customs ▪ Passenger ▪ Cargo	▪ Although Customs can be flexible in clearing procedures with passengers, they have become highly reliant on technology and delays would ensue if they had to set up outside of their normal customs area during a disaster; ▪ 80% of cargo customs clearance is done electronically. The 20% of businesses not captured by this system are small businesses who would be impacted by a disruption caused by disaster; ▪ A disaster would cause a loss of revenue from imported goods until flights were again operational.
8. Financial Institutions	▪ Financial institutions rely on air transportation for moving paper items such as deposited checks and bill payments.

Stakeholder Group	Potential Impact
9. Health care Institutions ▪ Canadian Blood Services ▪ Health Clinics ▪ Hospitals	▪ The health care sector relies on air transportation for movement of some time-sensitive items such as blood and transplant organs; ▪ Remote blood centres would be closed as it would not be possible to process the fresh blood supply within the required time-frame; ▪ There would be costs in moving to alternative road transportation for locations that were close enough to still have blood products processed within the eight hour time-frame; ▪ There would be costs associated with getting extra staff on to process blood during a disaster; ▪ In an extended disaster there would be problems in relation to blood storage of local blood donations; ▪ In a disaster there would be problems getting vaccine supplies in to health clinics; ▪ The health care sector in British Columbia relies on air transportation for obtaining many medical supplies.
10. Municipal Governments	▪ Communications problems can develop because of the different levels of governments involved in airport emergency response; ▪ Confusion can occur with regard to what services municipal governments can be reimbursed for during an emergency response; ▪ There would be an increased impact on all city services.
11. Tourism ▪ Cruise ships ▪ Hotels ▪ Other tourism-related businesses	▪ Disasters that affect Vancouver's reputation as a destination, such as earthquakes, would cause major and sustained losses to tourism; ▪ Tourism is highly sensitive to terrorism events; ▪ The cruiseship-related industry is especially at risk of losing business to Seattle in a disaster; ▪ There would be a ripple effect on all of the businesses that serve the cruise ship trade: harbour pilots, stevedores, longshoremen, cleaning services, security, food suppliers, etc., as well as lost tax revenue; ▪ Small businesses in the tourism sector and those with small margins and cash reserves are especially vulnerable in a disaster; ▪ A disaster in the summer would have especially great impacts on tourism, particularly if it were to occur on a weekend; ▪ Some businesses may experience short-term gains from the disaster, but this would be more than offset by longer-term losses; ▪ Lost business in the tourism sector is very difficult to recapture; ▪ The financial health of long-distance owners can determine the survival of a hotel in a disaster situation; ▪ There is a ripple effect on local small businesses that supply food, beverages, and repair services to hotels that are impacted by airport closure; ▪ The logistics of getting staff to work and keeping them on site during a disaster represent added costs to hotels; ▪ Reductions in flight crews due to diversions and cancellations would result in loss of business for airport hotels that have contracts with the airlines.

5.0 "Best Practice" Knowledge

One major theme emerging from the interviews conducted in this study was the almost universal lack of contingency planning for major airport disruptions, except among direct users such as air courier companies. Businesses and organizations, even if heavily reliant on air transportation, either assumed that the airport would be functional (even in a major earthquake) or assumed that if the airport were to close, there would be nothing they could do to plan around it.

However, their collective experiences in the Nisqually earthquake and the 9/11 terrorist events yield some insights as to "best practices" that can help businesses prepare for airport contingencies. Lessons learned and "best practice" suggestions are listed below. They are organized in terms of actions for individual businesses and for business community groups, respectively. Note that an accompanying booklet, "Airport Closures: A Guide for Businesses," has been included in Appendix C.

Business continuity planning

A business continuity plan for handling airport disruptions should include the following considerations:

- *Information on possible alternative airports.* One alternative may not be sufficient. Key information to be obtained includes: contact persons at the airports, hours of operation, rules and regulations regarding cargo handling, details on the types of aircraft that can be accommodated. This information should be maintained and kept up-to-date.
- *A plan for alternative ground transportation.* Should air transportation be significantly disrupted, many businesses would have to switch to ground transportation. If this would require contracting out, then there should be an up-to-date resource list of trucking firms and contacts that can be called on in an emergency. Because of the chaos at the disaster site, communications around transportation should be handled from an alternative site, such as the head office. It is important for this alternative ground transportation plan to have been tested.
- *Plans for handling supply shortages.* It may be possible to share supplies with other local branches of your business, or other related businesses.
- *Plans for storing excess products.* With disrupted air transportation, businesses that must keep goods flowing may face a problem with temporarily storing goods. Planning should also address handling priorities.
- *Plans for handling perishable goods in a disaster.* There should be an up-to-date list of potential alternative local purchasers if the goods cannot be moved to their planned destination in a timely manner. Some businesses freeze fresh goods (such as farmed salmon) if it cannot be moved quickly and sell it as a different product.
- *Building redundancy into your business's use of transportation.* Alternative transport providers or modes are useful in case some are disrupted.
- *Plans for disruptions affecting a large region.* If Vancouver International Airport is not available following a major earthquake, terrorist event, or other disaster, other regional airports may also be disrupted.

- *Assessment of the critical needs of your business.* These may include power, water, etc. There may be ways to share planning for these critical needs with other businesses who share the premises. It may be possible to offer reduced service to keep business going in a contingency (e.g., offer cold food instead of hot food).
- *Designated disaster response team(s).* In a large business there may be more than one response/support team. If all teams use the same tools, processes and procedures, when one team is unavailable because of the disaster, other teams (e.g., from another region) can take over.
- *Emergency communications plans and options.* Emergency 1-800 numbers can be very useful for obtaining and relaying information to employees when local lines are jammed after a disaster. 1-800 numbers can be used to take forwarded calls, for example, at a head office outside the disaster area. Another possibility is an emergency telephone system based on cellular telephones. If business relocation is necessary, this system is portable and can maintain continuous accessibility to customers.
- *Training of multiple staff members in emergency procedures.* Redundancy is important in case some staff are unable to report to work in an emergency.
- *Development of networks with related businesses.* This may include practiced emergency planning with several organizations working together. An important element is knowing who to contact at other businesses and organizations. Cooperation during an emergency is facilitated by established relationships of trust.
- *Familiarity with the contingency plans of suppliers and related businesses that you depend on.* This includes air courier services.
- *A clear policy on what the expectations are on staff in an emergency.* Some businesses require that employees have a home emergency plan so that things are in place there making them more available for work. There may also be a need to have a plan for getting employees to work and keeping them on site during the crisis as they are needed.
- *Plans to reallocate staff as needed.* Reallocation to unaffected facilities may avoid the need to lay off staff.
- *Plans for layoffs in a disaster.* Some businesses stressed that if layoffs are needed in the aftermath of a disaster, they should be implemented quickly to avoid further losses. This may involve maintaining flexible labour arrangements even under non-disaster conditions.
- *Plans for maintaining customer relations in a disaster.* This includes plans for keeping customers informed (e.g., a Web site of information on goods movement status that can relieve the pressure of large numbers of direct calls). It may be important to arrange compensation packages or discounts to customers to maintain loyalty.
- *Plan for advertising and marketing to regain customers after a disaster.*
- *Plans to offer alternative products or services in an emergency.* Some businesses may be able to capitalize on the demand associated with reconstruction, such as the influx of emergency personnel, the need for emergency equipment and disaster supplies, etc.
- *Familiarity with your insurance policy.*

- *Information about disaster assistance*. This includes knowledge of the types of assistance that may be available, as well as the documentation that is required to apply for the aid.

Business community preparedness

- *Lobbying efforts by businesses as a community may be needed in order for businesses' interests to be heard in the aftermath of a disaster*. Businesses should be prepared for political decisions in terrorist events. After 9/11, many air transportation restrictions were imposed by government agencies that were strongly influenced by political considerations and made in an atmosphere of very limited information. These restrictions had major negative impacts on some types of businesses.
- *Business associations can serve as a valuable, centralized source for business-related information*. Lack of information or conflicting information is often a major problem in the aftermath of a disaster. While local government often serves as a centralized information source for the public, business associations can play the same role for the business community. It can, for example, gather information about airport status, business loans, traffic pattern changes, etc. This information can be disseminated through phone, email, or Web site.

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Appendix A – Study Participants

The following organizations have participated in the study to date. In some cases, we conducted interviews with key personnel, sometimes in more than one department. In other cases, the organizations provided background information or reports, or reviewed portions of this study. For reasons of confidentiality, we do not identify the individuals we contacted within the organizations. We also do not list those organizations that participated on condition of anonymity.

- Aeroground, Inc.
- Airborne Express (USA)
- Arlington Economic Development (USA)
  - Arlington Convention and Visitors Service
  - Business Investment Group
- Arlington Virginia Chamber of Commerce (USA)
- Bank of America (USA)
- Bax Global Canada Ltd.
- B.C. Stats
- Cara Operations Ltd.
- Cathay Pacific Airlines & CP Cargo Division
- Canada Post
- Canada Customs and Revenues Agency
- Canadian Bankers Association
- Canadian Blood Services
- Canadian Payments Association
- Children's and Women's Health Centre of British Columbia
- City of Richmond
- Delta Hotel
- Four Seasons Hotel (USA)
- Gardenworks
- Greater Washington Board of Trade (USA)
- Legal Sea Foods (USA)
- Metropolitan Washington Airports Authority (USA)
- Montreal Dorval International Airport
- North West Cruiseship Association
- Pacific Geoscience Centre (Geological Survey of Canada)
- Providence Health Care
- Purolator Courier Ltd.
- RCMP
- Scotiabank
- Shuttle Express (USA)
- Tourism Vancouver
- Transpacific (Customs Brokers / Freight Forwarders)
- Transport Canada

- Vancouver International Airport Authority
- Washington Airports Task Force (USA)
- Another airline

The following organizations were contacted but declined to participate:

- FedEx
- NAV Canada
- United Parcel Services

Appendix B – Summary of Major Potential Impacts and Vulnerabilities

Key Stakeholders and Major Impacts

Air Transportation (Passenger)

- Air traffic diversions in a disaster may cause difficulties and entail additional costs for airlines in terms of staffing and servicing the flights.
- A disaster may entail significant financial impacts due to passenger cancellations and refunds.
- The impact on airlines would be greatest if the disaster occurred in the peak summer season.

Air Transportation (Cargo)

- Because of the time-sensitive nature of many air-transported goods, even short disruptions in the air transport system can cause major business impacts.
- International (overseas) cargo would be especially impacted.
- Restrictions on nighttime landings could have major repercussions for some cargo transporters, and may cause Vancouver to be dropped from some cargo routes.
- Air cargo capacity on commercial airlines is vulnerable to flight cancellations and scheduling changes that are made on the basis of passenger considerations.
- Air cargo can be impacted by restrictions and regulatory policies originating not only with the federal government, but also in the U.S.
- Transshipment cargo is especially at risk of being diverted away from Vancouver in the event of a local disaster.
- Sea-air transport would be highly vulnerable to airport disruptions.
- Smaller, less diversified cargo-related companies would be especially hard hit.
- The industry's locational concentration around the airport would compound the effects of an earthquake disaster.

Businesses at the Airport

- Businesses that serve the airlines and passengers at the airport – particularly small businesses – would be heavily impacted by airport disruption.
- Reductions in business at the airport would have significant ripple effects on the Greater Vancouver regional economy.

Tourism

- Disasters that affect Vancouver's reputation as a destination, such as earthquakes, would cause major and sustained losses to tourism.
- Tourism is highly sensitive to terrorism events.
- The cruiseship-related industry is especially at risk of losing business to Seattle in a disaster.
- Small businesses in the tourism sector and those with small margins and cash reserves are especially vulnerable in a disaster.
- A disaster in the summer would have especially great impacts on tourism, particularly if it were to occur on a weekend.
- Some businesses may experience short-term gains from the disaster, but this would be more than offset by longer-term losses.
- Lost business in the tourism sector is very difficult to recapture.

Agriculture, Fisheries, and Aquaculture

- Exporters of high-end fisheries products to Asia would be especially hard hit.
- Exporters of cherries (in season) and other fresh produce may be very hard hit.

Small Businesses

- Small businesses are especially vulnerable to airport disruptions.

Rural British Columbia Communities

- Remote communities outside of the Lower Mainland are especially vulnerable to air transportation cutbacks in the event of a disaster in Vancouver.

Health

- The health care sector relies on air transportation for movement of some time-sensitive items such as blood and organs for transplants.
- The health care sector in British Columbia relies on air transportation for obtaining many medical supplies.

Appendix C – *Airport Closures: A Guide for Businesses*

The content of this appendix has been laid-out in booklet format, and is intended for double-sided printing. If single-sided printing is used, every second page will appear upside down.

Airport Closures:

A Guide for Businesses

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Prepared by

Laurie Pearce

Stephanie Chang

Diana Ericson

Disaster Preparedness Resources Centre

University of British Columbia

1933 West Mall

Vancouver, BC Canada V6T 1Z2

Introduction

The following guidebook is written to assist businesses that may be affected by an airport closure. Two sources of data were used to develop these guidelines. One data source was a set of interviews conducted with representatives of businesses directly impacted by either the terrorist events of September 11, 2001, or the 2001 Nisqually Earthquake in the state of Washington. The second data source consisted of two scenarios developed by the researchers. These scenarios were based on a potential earthquake in southwestern British Columbia and a terrorist attack at Vancouver International Airport. They were used in the interview setting with airport, business, and government personnel to develop some "best practice" recommendations for businesses. Although the scenarios focused on earthquakes and acts of terrorism, the findings on business practices in this study are relevant to any major disaster that resulted in an airport closure. These two scenarios have some key differences that should be noted. Acts of terrorism involving airports are generally localized and of short duration, while earthquakes and other natural disasters affect not only the airport but the surrounding community as well.

The guide has been developed to assist businesses that may be affected by an airport closure because they are:

- located in an airport
  - such as restaurants and retail stores
- in an area immediately surrounding the airport
  - such as brokerage companies, rental car agencies, hotels
- away from the airport but dependent upon the airport for imports, exports, or tourists
  - such as cruise ships, hotels, retailers
- dependent on the airport for mail delivery or other services

For a more in-depth review of the interviews and scenarios, the reader is referred to the report, "Airport Closures in Natural and Human-Induced Disasters: Business Vulnerability and Planning" (Disaster Preparedness Resources Centre, University of British Columbia, 2003)

1. Understanding the Impacts of Earthquakes on Airports

In the 1964 Alaska earthquake, the control tower at Anchorage airport collapsed, the terminal building suffered major damage, and runways and pipelines were cracked.

In the 1989 Loma Prieta earthquake, San Francisco International Airport suffered nonstructural and equipment damage in its control tower and terminal. Airport service was stopped for 13 hours. However, the primary reason for this closure was that air traffic controllers had difficulty getting to work and there were insufficient controllers available to safely operate the control tower. In the same event, the Oakland International Airport lost 3,000 ft. of its 10,000-foot main runway due to liquefaction and lateral spreading of the ground. Cracks were as wide as 3 feet, and sand boils as wide as 40 feet. Emergency repairs of 1,500 of the 3,000 damaged feet took place over 30 days; repairs of the final 1,500 feet were not completed until 6 months after the earthquake. For some businesses, the impacts were significant; for example, one financial institution continued to charter helicopters as an alternative mode of transport for up to 3 months after the disaster.

During the 2001 Nisqually earthquake, SeaTac International Airport in Seattle suffered control tower damage. Water damage also closed one of the terminals for 3 days. Boeing Field (King County International Airport), the major cargo airport in the region, suffered major liquefaction damage. Its short runway was closed for 2 days. The long runway was heavily damaged. Large jets were unable to take off for several days, and it was approximately 2 weeks before emergency repairs on the long runway were completed.

According to Werner (1995), "seismic standards for the nation's air transportation system and its components do not reflect the importance of the system to the economy and to life safety, and lag far behind the current state of planning and engineering knowledge for many other critical facilities of this type" (p.63).

2. Understanding the Impacts of Terrorism on Airports

The 9/11 terrorist attacks had an impact on all North American airports. After the second attack on the World Trade Centre, the Federal Aviation Authority (FAA) issued a "ground stop" which prevented all civil flights from taking off, and after the Pentagon was hit, the FAA ordered the grounding of all flights in U.S. air space. When word came that a 4th plane was bound for the White House, Metropolitan Washington Airports Authority began to evacuate the Reagan National and Dulles International airports. The closure of air space over North America was an unprecedented event.

As a result of the 9/11 events, Canada received 224 diverted passenger flights carrying more than 33,000 passengers and 10 diverted cargo flights distributed at airports across the country (Transport Canada, 2003). All passengers and cargo had to be unloaded and cleared through customs. All passenger flights, under stricter security conditions, had been given clearance by the morning of September 13th when U.S. air space was again open, but restrictions on cargo transportation continued until the evening of September 14th (ibid.)

The Vancouver International Airport received 34 diverted aircraft, carrying more than 8,500 passengers and 24,000 pieces of luggage. Passengers were deplaned and cleared through customs, while luggage was separately unloaded and re-searched. Normal flight scheduling did not resume until September 14th.

The airport most affected by the event was perhaps the Reagan National Airport in Washington, DC. Because of security concerns, government officials ordered it shut down right after the attacks and it remained so for the next 23 days. Thereafter, it reopened in 4 phases over 6 months. On April 15, 2002, the airport was officially 100 percent opened. However, restrictions remained in effect, banning large airplanes, private aircraft or general aviation, nighttime takeoffs and landings, and certain flight paths.

3. Airplanes Often Do Not Fly Due to Adverse Weather Conditions: What's Different About Earthquakes and Terrorism?

In a snowstorm, or during a thunderstorm, airlines may not be operating because of the risk of accident during landing or take off. However, usually the airport is still open and utilities are functioning. Delays, while annoying, are usually for short periods of time. Although security measures are strict, goods can be accessed and re-routed if necessary. Businesses in and around the airport can enjoy a dramatic increase in business as passengers purchase books, meals, and other goods.

During 9/11, not only were airplanes not allowed to fly over North American airspace, no access was allowed to cargo and passenger luggage. This lasted for three days, and numerous perishable goods had to be destroyed at great cost to the exporter. While a single terrorist incident, at one location would not close down all airports, it is probable that access to any goods in process of being exported or imported would be severely restricted. Furthermore, this access could last for many hours, and even perhaps days.

Perhaps one of the more critical factors is that following a major terrorist attack at an airport, it is not unusual to witness a decline in tourist travel. Businesses that are dependent upon the tourist industry also suffer.

Following a major earthquake, it is likely that most airports close to the epicentre would experience damage. Even if parts of the airport remained undamaged, there may be extensive damage to the runways and electrical systems. Access to the airport may be limited for some time. In such an event, many people would cancel their trips to visit and those already here would plan to leave the city as soon as possible. Depending on how quickly reconstruction occurs, the tourism industry could suffer a devastating impact for a considerable period of time.

4. Key Elements of Business Continuity

The purpose of business continuity planning (BCP) is to ensure that your business is able to survive the effects of a major disaster.

This guide is designed to assist in the development of a BCP in order to deal with the effects of an airport closure due to events such as earthquake or terrorism. It is not intended to substitute as a Business Continuity Plan, but rather to supplement plans for emergency response and recovery by providing data based on actual experience.

Key elements of a BCP include completing a Business Impact Analysis (BIA). Completing a BIA involves:

1. completing a hazards and risks analysis
2. determining the company's essential operations. There are always some jobs which are not immediately essential to a company's survival. For example, it may be possible for the filing to pile up or to delay launching a new marketing plan. It is important to identify and prioritize those operations that are critical to the business's survival and focus on ensuring that those operations can continue.
3. identifying which resources are needed in order to carry out these operations. Resources may be material (e.g., a specific machine), or human (e.g., the machine operator).
4. completing a vulnerability assessment. Some of the vulnerabilities may include: availability of transportation systems and routes; availability of usual suppliers; availability of staff; access to the business by customers; communication and computer systems; the structural viability of buildings; availability of utilities; damage and accessibility of inventory; adequate insurance; and accessible cash.

The BCP indicates how these vulnerabilities can be addressed. This guidebook will identify potential vulnerabilities due to extended airport closures and make recommendations for consideration in the development and implementation of a corporate BCP.

5. Critical Needs

Most businesses cannot function without electricity.

- *Complete an assessment of the critical needs of your business.* These may include power, water, etc. There may be ways to share planning for these critical needs with other businesses who share the premises. It may be possible to offer reduced service to keep business going in a contingency (e.g., offer cold food instead of hot food).

- *Have a clear policy on what the expectations are on staff in an emergency.* Some businesses require that employees have a home emergency plan so that things are in place thereby making them more available for work. There may also be a need to have a plan for getting employees to work and keeping them on site during the crisis as they are needed.

- *In a disaster "cash" may be essential when other financial services are not available. Make sure you have access to sufficient cash to carry out essential operations.* Take into account that money is flown into local bank branches via air transportation. Also take into account that banks do not normally keep a large supply of cash on hand which is not earning interest. However, during a disaster, even banks hoard cash, in response to the increased need.

- *Develop a good relationship with your broker.* There is a provision (used in emergencies) in the customs arrangements that brokers can deal with clearing imported goods first, then deal with the government agencies (e.g., customs, agriculture, health). The brokers essentially take responsibility for the cargo in the interim. Trust is very important. This would be a challenge if dealing with new goods and new customers in a disaster.

6. Exports and Imports

Now cargo on passenger airlines has to be held before flying – in case there are any timed explosive devices that could go off. Because of the time-sensitive nature of many air-transported goods, even short disruptions in the air transport system can cause major business impacts.

Plan for handling perishable goods in a disaster. There should be an up-to-date list of potential alternative local purchasers if the goods cannot be moved to their planned destination in a timely manner. Some businesses freeze fresh goods (such as farmed salmon) if it cannot be moved quickly and sell it as a different product. International (overseas) cargo would be especially impacted. The food industry is also somewhat seasonal; currently, there is a peak for food imports for Chinese New Year.

- *Seasonal exporters are at increased risk.* Exporters of cherries, apples, and other fruits and produce must ship their produce during peak season and failure to do so may lead to bankruptcy. Local farmers would be hurt most by airport closure during the summer season because it would be expensive and time-consuming for them to establish alternative links. Exporters should discuss contingency planning with their brokers and cargo handlers and ensure that they have contingency plans for handling such goods should local airports be closed.

- *Airports are potentially subject to widespread damage following an earthquake, and there is always the possibility of major aftershocks.* Airplanes may be diverted to airports hundreds of kilometres away. As well, there may be restrictions on nighttime landings – if runway lights are not functioning, it could have major repercussions for some cargo transporters.

6. Exports and Imports cont'd...

Air cargo capacity on commercial airlines is vulnerable to flight cancellations and scheduling changes that are made on the basis of passenger considerations. On the other hand, passengers may be bumped from flights in order to handle greater quantities of more lucrative cargo.

Seasonal importers are at increased risk. Importers of fashion clothing must sell their goods during the appropriate season and failure to do so may lead to bankruptcy. Exporters should discuss contingency planning with their brokers and cargo handlers and ensure that they have contingency plans for bringing such goods into the city should local airports be closed to air traffic. Disruptions in November or early December would affect shipments for Christmas.

Transshipment cargo is especially at risk of being diverted away from airports in the event of a local disaster.

Sea-air transport would be highly vulnerable to airport disruptions.

"When the Vancouver Airport was closed due to 9/11, one fresh shellfish exporter lost over $1 million."

Air cargo can be impacted by restrictions and regulatory policies originating not only with the Canadian federal government, but also in the U.S.

- *Understand what Customs services exist so as to minimize down time.* They have a pre-clearance, courier program. The importer fills out paper work which is sent on in advance of the cargo arriving so that he or she can get the goods cleared before arrival. Once the wheels of the aircraft are up, they can clear customs, so the process can take place 3 – 4 hours before the shipment arrives

7. Insurance

"Business Interruption Insurance only covers you if your business is not able to operate. If your business is out of business because the airport is closed, you are out of luck."

You need to be very familiar with your insurance coverage. After the disaster is not the time to realize that you are not covered.

One company found that although they do have business continuity insurance, it doesn't cover disruptions at the airport. (It does cover power outage, building damage, etc.) This is a concern and talks with several insurers disclosed that none offer coverage for airport disruptions because it is hard to define what constitutes a disruption.

- *Information about disaster assistance.* This includes knowledge of the types of assistance that may be available, as well as the documentation that is required to apply for the aid.

In a disaster it is likely that priority will go to high-priced and critical mail. Other mail will be diverted to surface transportation.

- *Delayed legal documents can be costly.* Check to see which legal documents, such as insurance, can now be sent by e-mail systems. Signatures and date stamps can also be sent this way. Many companies will accept faxes pending the original in the mail.

Much to one company's amazement, post-earthquake, they were inundated with calls from people who wanted to work for the company against their insurance company for a fee of approximately 5%. This was something they knew nothing about and had not been prepared for. In the end, they worked directly with the insurance company. Their rates did not rise significantly as a result of this claim.

8. Communications

In a major earthquake it is unlikely that the phone lines and cellular phones will be operating immediately after the earthquake.

- *Emergency communications plans and options.* Emergency 1-800 numbers can be very useful for obtaining and relaying information to employees when local lines are jammed after a disaster. 1-800 numbers can be used to take forwarded calls, for example, at a head office outside the disaster area. If business relocation is necessary, this system is portable and can maintain continuous accessibility to customers.

"The Nisqually Earthquake was a wake-up call. Now, the company uses a phone tree system that operates from their corporate offices to the local station level. During 9/11 the company found that conference calls were preferable and served an essential purpose in order to have all key personnel on the line together."

"The only phones they had were cell phones so they set up a "daisy-chain" phone system consisting of 6 cell phones. They had to call the phone company and have them forward calls to their regular business line to two cell phone numbers. Those two people would take the incoming calls and get the name and number. Then they would forward this information to two other cell phone numbers where people would get back to the callers with the information and scheduling. This left the two cell phones free to take incoming calls since they had no way of putting people on hold and risked losing business if people got a busy signal. Their website was working so they posted the numbers that people were to call on their website."

9. Dealing with Staff

"Fortunately, when the airport was closed for such a long time we were able to move our staff to our other locations. Some staff used banked vacation to avoid being laid off, and in the end we only lost two staff persons to other businesses."

Your staff is essential.

- *Plan for layoffs in a disaster.* Some businesses stressed that if layoffs are needed in the aftermath of a disaster, they should be implemented quickly to avoid further losses. This may involve maintaining flexible labour arrangements even under non-disaster conditions. Reallocation to unaffected facilities may avoid the need to lay off staff.

- *Be adaptive.* Following 9/11, some companies dependent upon air cargo dealt with the low period by cost cutting, trimming, and developing new procedures. They laid off employees for the first time in years. Although companies have recuperated, in some cases the full-time to part-time ratio has been reversed. They now have more part-time workers whose hours can be adjusted according to the workload and for whom they do not have to pay benefits.

- *Look after your staff who are on travel status.* When 9/11 hit, in one large company, up to 1000 people were out of town. These were high-level positions, and represented critical people in the organization. Fortunately they had laptops. They set up conference calls and bridgelines to communicate. Travel advances had to be negotiated.

- *A clear policy on what the expectations are on staff in an emergency.* Some businesses require that employees have a home emergency plan so that things are in place; thereby making them more available for work. There may also be a need to have a plan for getting employees to work and keeping them on site during the crisis as they are needed.

10. Alternate Locations and Storage

- *Ensure you have adequate storage sites available for storing excess products.* With disrupted air transportation, businesses that must keep goods flowing may face a problem with temporarily storing goods. Some courier companies have no facilities to store the stockpiled courier goods – and after 9/11 this proved to be problematic.

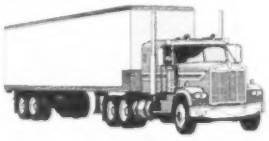
  When increased usage of sea-air cargo handling, many companies are reliant on the quick movement of containers in and out of ports and airport grounds. If either locale is not being used, there may be an urgent need for warehouse space. Since 9/11, as an alternative strategy, some brokerage companies now use local trucking companies and have prior arrangements with local warehouses for storage.

> *"After the earthquake, one transportation provider had no power and their building was so severely damaged that they had to leave it. They realized that they were very dependent on their computer system so they went back in and collected a few computers and put them in the back of a van. They had no backup site in their contingency plans.*
>
> *The first problem was to get the computers operating so they ended up going over to their financial officer's (CFO) house and set up in her kitchen and living room. This took 3 to 4 hours. Their radio system was also dependent on power, but they could get this operating from the van so their dispatchers worked from the van in the driveway. They spent that first night at the CFO's house then moved to a hotel where they operated out of two rooms (one for the reservations and one for the dispatchers) for 2 weeks."*

11. Alternate Transportation

- *Obtain information on possible alternative airports.* One alternative may not be sufficient. Key information to be obtained includes: contact persons at the airports, hours of operation, rules and regulations regarding cargo handling, details on the types of aircraft that can be accommodated. This information should be maintained and kept up-to-date.

- *Plan for disruptions affecting a large region.* Be aware that if one local airport is not available following a major earthquake, terrorist event, or other disaster, other regional airports may also be disrupted. Even if the small airports are functioning be aware that following the Nisqually earthquake small airports were immediately overwhelmed. Priorities had to be established and the chartered aircraft were made available to companies with contingency plans that included the use of small planes available on an hour's notice. After the 1989 Loma Prieta Earthquake one bank used chartered helicopters for up to 3 months



"Since 9/11, one Seattle-based air cargo company has concentrated on expanding their trucking routes. If planes are unable to fly out of one airport, their trucks will transport the goods to the next closest airport in order to keep the customers satisfied."

- *A plan for alternative ground transportation.* Should air transportation be significantly disrupted, many businesses would have to switch to ground transportation. If this would require contracting out, then there should be an up-to-date resource list of trucking firms and contacts that can be called on in an emergency. Because of the chaos at the disaster site, communications around transportation should be handled from an alternative site, such as the head office. It is important for this alternative ground transportation plan to have been tested.

12. Public Relations and Marketing

"One of the outcomes of the 9/11 event was that the [cargo] company realized that it needed to get more timely and accurate updates on its transport timetable. The company had to handle many calls from customers and they found that putting current information on their web page was the best way to handle this as it was easy to refer people to the company web page."

Make sure you keep customers updated with your service.

- *Have a plan for maintaining customer relations in a disaster.* This includes plans for keeping customers informed. It may be important to arrange compensation packages or discounts to customers to maintain loyalty.

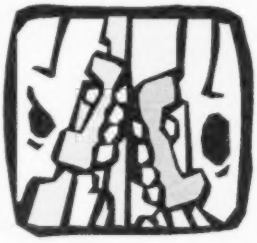
Plan for advertising and marketing to regain customers after a disaster.

- *Develop plans to market your city after a major disaster so as to encourage tourists to visit.* After 9/11, Washington DC, which is a major destination for school groups found that many of these tours have now been stopped. Some of these may simply have been postponed, while others will be permanent losses. The convention business has not yet fully returned. The drop in tourism has hurt related businesses such as restaurants, car rentals, and so on. Hotels, particularly those at or near the airport, were also heavily hit. Overall hotel occupancy in October 2001 dropped 16 percent compared to the previous October. An even greater loss, of 25 percent, was suffered in room revenues. Many hotels lowered their room rates in order to generate business and remain in operation (Arlington 2001). Annual statistics show that hotel occupancies in the region have yet to recover.

"After 9/11, many of the hotels that took the biggest hit, nevertheless offered free accommodation to the families of the victims."

13. Mutual Aid and Supports

- *Plans for handling supply shortages.* It may be possible to share supplies with other local branches of your business, or other related businesses.



- *Designated disaster response team(s).* In a large business there may be more than one response/support team. If all teams use the same tools, processes and procedures, when one team is unavailable because of the disaster, other teams (e.g., from another region) can take over.

- *Development of networks with related businesses.* This may include practiced emergency planning with several organizations working together. An important element is knowing whom to contact at other businesses and organizations. Cooperation during an emergency is facilitated by established relationships of trust.

"When the airport closed, there's no question the independent merchants had a much tougher time of it than those companies, like ours, with several operations in town. We were able to move our staff and re-distribute our goods to our other restaurants."

- *Business associations can serve as a valuable, centralized source for business-related information.* Lack of information or conflicting information is often a major problem in the aftermath of a disaster. While local government often serves as a centralized information source for the public, business associations can play the same role for the business community. They can, for example, gather information about airport status, business loans, traffic pattern changes, etc. This information can be disseminated through phone, email, or web site.

14. Tourism

- **Tourism is highly sensitive to terrorism events.**
- **The cruiseship-related industry is especially at risk of losing business to Seattle in a disaster.**

- **Lost business in the tourism sector is very difficult to recapture.** The hotels did well in the short term with stranded visitors, but then lost business.
- **Small businesses in the tourism sector and those with small margins and cash reserves are especially vulnerable in a disaster.**
- **A disaster in the summer would have especially great impacts on tourism, particularly if it were to occur on a weekend.**
- **In a crisis, the tourist sector is usually the hardest hit because it depends on disposable income. Holidays are the first thing that people cut. Senior citizens are especially vulnerable to these events. Business travel will continue.**

Following 9/11, in Washington DC, "*cab operators relying on airport traffic reported a 60 percent drop in demand, while those with less airport dependence reported a 15 percent drop.*"

- *Travel patterns change after disasters.* After 9/11 Americans are traveling locally in the U.S. or they travel by car to BC. After 9/11, in order to survive, hotels had to change their marketing strategy: they focused on Canadian travelers, small business and corporate travel. They couldn't count on traditional tourism any longer. Cruiseships are deliberately planning itineraries that are close to home. In the U.S. they fit this into the "Homeland Policy." 85% of the cruise business is American. Now many ports in America are becoming bases for cruiselines – New Orleans, Tampa, New York, Boston.

15. Computers and Back-Ups

- *Expect data phone lines to be down.* Some companies found that if they did more of their transactions electronically using high-speed cable, they would have been better off. Banks are moving increasingly to electronic transactions. However, they remain dependent on air transportation for some items.

- *Evaluate potential use of a Recovery Hot Site.* Many large corporations have recovery sites and may share hot sites. If a hot site is located in another province or state you may be dependent on air transportation to get there. Remember that there is a priority list at hot sites. Those who have put out enough money get their spot guaranteed. Realize that you may need to make alternative arrangements to get both materials and people to the hot sites by using chartered buses, trucks, and even trains if air transportation is not possible.

- *What are the links between your business and your computer?* For many airport brokers, almost all of the customs clearances are done via computer; only a small percentage still relies on paper. If your computer is not functioning post-earthquake, business will go to other brokers. Make sure your computer will not fall to the ground or otherwise be damaged during an earthquake.

> *"I have all of my important client information and contact numbers in my company's Emergency Plan. It's true that it is all on my computer and if my computer was damaged in an earthquake…."*

- *Have a back-up system.* After the earthquake one company now makes sure they have a backup for reservations. Hourly backups put information on a portable computer system. It is battery operated and they can print out data from there if needed.

16. Suppliers

- *Be familiar with the contingency plans of suppliers and related businesses that you depend on.* During a disaster, networks with suppliers can be disrupted. Most business is done on a "just-in-time" basis so replenishing happens everywhere. Most businesses do not maintain warehouses so they have only limited supplies on hand. If transportation is disrupted, those supplies will be used up and many companies rely on air cargo to restock their supplies.

Air couriers that don't have a ground network would have a much harder time dealing with an air transportation disaster.

- *Check that airport closure is in your courier's emergency plans.* Make sure they have a crisis management team in all locations along with a communications system and protocols in place.

- *Know where your goods come from.* With globalization there has been a growth in sea-air transportation of freight. For example, fabrics go by sea from Asia to Vancouver where they are cleared through the port, then booked to go by air to Europe. Despite the extra costs of air travel, this is seen as more efficient than shipping to Europe, which takes too long. Another example is machinery: although a car may be sold in Europe, its engines may be shipped to Vancouver from Asia, then flown to Europe and sent to various plants to be assembled. This cargo goes through Vancouver because of the geography of air connections and networks.

Major disasters can disrupt normal supply routes. Some shipping and courier companies have guaranteed delivery services to deal with arrival of critical machinery or parts. Users of this service include factories, manufacturers, trade shows with deadlines, mills, etc.

17. Opportunities

- *Collective lobbying efforts by businesses may be needed in the aftermath of a disaster.* Following 9/11, many air transportation restrictions were imposed by government agencies in an atmosphere of limited information and political expediency. These decisions have had a major ongoing negative impact on some businesses. Proactive action to make business concerns and needs known is imperative.

Take advantage of potential markets

Plans to offer alternative products or services in an emergency. Some businesses may be able to capitalize on the demand associated with emergency response and reconstruction, such as the influx of emergency personnel, the need for emergency equipment, disaster supplies, building materials, etc.

- *Businesses can capitalize on new markets.* While many airlines may waive ticket restrictions on getting tourists out of the earthquake zone, demand for flights after an earthquake might actually increase, especially inbound flights as people want to come and see their families. Following the 1999 Taiwan earthquake, there was a dramatic rise in people going to Taipei.

- After 9/11 the hotel stopover business has increased because of the two-hour check in time. People on early flights need to come in the night before. In some cases local people living some distance from the airport may want to take advantage of hotels to avoid getting up in middle of the night.

- *Be ready.* The October-November 8-week port-workers strike in the U.S. actually benefited Vancouver airfreight business. A number of companies had their suppliers redirect their shipments to Vancouver Harbour where the cargo handlers took it by truck to the U.S. Hong Kong and Asia also flew shipments to Vancouver and put them on trucks from here to the U.S. While some cargo handlers were able to capitalize on this situation, others were not.

18. Facts and Figures

- $40,000 per day is collected in tax revenue from cargo at Vancouver Airport.
- 80% of cargo customs clearance is done electronically. The 20% of businesses not captured by this system are small businesses.
- Visitor spending per year in Vancouver is over $3.5 million.
- The average convention delegate spends $450 per day while the average tourist spends $150 per day.
- There are approximately 89,000 tourism-related jobs in Greater Vancouver.
- There are 8.3 million overnight visitors annually. Five million of those are from BC and other parts of Canada.
- There are 24,000 hotel rooms in Vancouver.
- Tourism is BC's second largest industry.
- The BC-Alaska Cruise attracts 750,000 cruise visitors per year.
- The busiest time at the Vancouver Airport is from 1130h to 1500h.
- 15% of inbound mail through Vancouver is by air. Approximately 11% of the total outbound mail is by air.
- 6,000 kilograms of mail goes out per day from Vancouver.
- Financial institutions are the largest users of the mail system.
- Canada Post doesn't deal with perishables or hazardous materials.

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Disaster Preparedness Resources Centre
University of British Columbia